AURORA®

PHOTOVOLTAIC INVERTERS

USER MANUAL

INSTALLATION and MAINTENANCE

Models:* ***PVI-55.0-YY(-TL)***
PVI-110.0-YY(-TL)
PVI-165.0-YY(-TL)
PVI-220.0-YY(-TL)
PVI-275.0-YY(-TL)
PVI-330.0-YY(-TL)

(*) "YY" indicates the country in which the product is on sale.
(*) "TL" indicates the absence of the insulation Transformer on board.

Rev. 1.0

LEGEND

Marks the reference to a paragraph in a chapter containing important safety information and warnings which must always be respected.

Means: “continued on next page”.

Indicates the end of a paragraph.

Symbols of this type refer to warnings in the same paragraph or otherwise to the page indicated. They contain information on personal safety and tips on how to reduce the risk of accidents and injuries.

Refers to a warning on possible damage contained in the same paragraph or on the page indicated.

Texts marked with this symbol contain indications concerning environmental protection.

Texts marked with this symbol contain additional information and insights.

DANGER

Texts marked with this symbol indicate provisions which, if not met, could result in death or serious injury to the person or persons involved.

WARNING

Texts marked with this symbol indicate provisions which, if not met, could result in slight or serious injury to the person or persons involved.

NOTICE

Texts marked with this symbol indicate provisions which, if not met, could result in potential damage or malfunction of the device and things in general.

Paragraphs marked with this symbol indicate the necessity of using adequate protection prior to operations (e.g. use of insulating gloves for work with voltages up to 1000 VDC, use of goggles, etc.).

THANK YOU FOR YOUR TRUST

The "AURORA" Power-One Inverter you have purchased is a device containing the latest technologies.

Before using this device for the first time, read these user instructions in order to fully and quickly learn the commands and functions, as well as the potential dangers for you and for others, and how to avoid them.

For further information about the device or in case of failure to provide part of the documentation that makes up the manual, contact “CUSTOMER SERVICE” available on website Power-one (www.power-one.com).

Questions, criticisms and suggestions are always welcome.

REVISION TABLE

Revision Document	Author	Date	Approved by	Description of Modification
0.0	A. Morucci S. Soldani	15-03-10	D.Nocentini	First Issue
1.0	A. Morucci S. Soldani	06-05-10	D.Nocentini	Various Updates and Integration New Documents

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TABLE OF CONTENTS

1. HOW TO USE AND READ THE MANUAL 12

1.1. DISPOSAL OF WASTE 12
1.2. SYMBOLS USED WITH THE PRODUCT 13
1.3. LABELS USED WITH THE PRODUCT 13
1.4. DOCUMENTS PROVIDED WITH THE DEVICE 14

2. IMPORTANT SAFETY INFORMATION 15

2.1. GENERAL INFORMATION 17

3. GENERAL INFORMATION AND FEATURES OF A PHOTOVOLTAIC SYSTEM 18

3.1. PHOTOVOLTAIC ENERGY 18
3.2. FUNDAMENTAL ELEMENTS OF THE PHOTOVOLTAIC FIELD: "STRINGS" AND "ARRAYS" 19

4. SCOPE AND GENERAL DESCRIPTION OF THE PRODUCT 21

4.1. TECHNICAL DESCRIPTION OF AURORA PVI-XXX.0(-TL) 25
4.1.1 Multi-Master 29
4.1.2 Multi-Master/Slave 29
4.1.3 1Master/N.Slave (Inverter ≥ 150kW) 29
4.1.4 MPPT (Maximum Power Point Tracker) 30
4.1.5 Special features 31

5. DESCRIPTION OF COMPONENTS AND COMPOSITION OF THE PVI-XXX.0(-TL) 32

5.1. OVERVIEW 32
5.2. DESCRIPTION OF THE INVERTER PARTS 34
5.2.1 ACBOX (A) 35
5.2.1.1 Version until 220kW with Transformer 35
5.2.1.2 Version ≥275kW and all models without insulation Transformer 37
5.2.2 DC Box (B) 39
5.2.3 55kWp Modules area (C) 39
5.2.4 AC Fuses area (D) 39
5.2.5 Framework (E) 39
5.2.6 Enumeration of the 55kWp Modules 39

6. DESCRIPTION OF THE INPUT CONFIGURATIONS AND DC SWITCHES OPERATION 40

6.1. POSSIBLE FIELD CONFIGURATIONS 40
6.1.1 Multi-Master 40
6.1.2 Multi-Master-Slave 41
6.1.3 Master-Slave with a single Master 42
6.1.3.1 Features of the external DC switch 43
6.2. FUNCTION OF THE DC DISCONNECTING SWITCHES IN EVERY FRAMEWORK 44
6.2.1 Multi-Master System 45
6.2.2 Multi-Master-Slave System 46
6.2.3 Master-N.Slave System 1 (with inverter ≥ 165kW) 47

7. PROTECTIONS 48

7.1. PROTECTION AGAINST MAINS BREAKDOWN 48
7.2. GRID INTERFACE PROTECTION DEVICE (SPI) 48
7.3. ADDITIONAL PROTECTION 49

8. RS485 SERIAL LINE 50

8.1. CONNECTION MODALITIES OF THE RS485 LINE 50
8.2. CONNECTION MODES FOR MONITORING 53

9. STORAGE AND HANDLING 55

9.1. PRELIMINARY CHECKS 55
9.2. HANDLING AND WITHDRAWAL OF THE PVI-XXX.0(-TL) FROM THE PACKAGING 56
9.2.1 Content of the packaging 56
9.2.2 Removal of the inverter from the wooden crate 57
9.2.3 Handling of the PVI-XXX.0 (-TL) 59

10. INSTALLATION 62

10.1. INSTALLATION LOCATION 62
10.2. POSITIONING IN THE CHOSEN PLACE 63
10.2.1 Air vents 66
10.2.2 Safety distance 68
10.2.3 Removal of panels to make the connections 70
10.2.4 Composition of the ACBOX area 71
10.2.5 Cable passage area 71

11. ELECTRICAL CONNECTION 74

11.1. PRELIMINARY OPERATIONS FOR THE ELECTRICAL CONNECTION 74
11.2. CONNECTION OF THE DC CABLES FROM THE PHOTOVOLTAIC FIELD 75
11.3. CONNECTION OF THE PROTECTION EARTH CABLE (PE) 77
11.4. CONNECTION OF THE AC POWER CABLES 78
11.5. CONNECTION OF AUXILIARY ENERGY SUPPLY 79
11.6. CONNECTION OF THE TWILIGHT SENSOR (ONLY FOR PVI-XXX.0 ≤220KW) 80
11.7. CONNECTIONS FOR COMMUNICATIONS / STATE SIGNALS 81
11.7.1 Connection for the user RS485 serial communication 82
11.7.2 Setting of the 120 ohm termination of RS485 83
11.7.3 Connection for the RS485 serial communication with PVI-STRINGCOMB(-S) 85
11.7.4 Connection for the state signalling of the single 55kWp modules. 85
11.7.4.1 TWILIGHT Mode. 85
11.7.4.2 GRID Mode. 85
11.7.5 Connection for the on and off command of the single 55kWp modules. 86
11.7.6 Setting of the communication addresses. 86
11.7.7 Final checks. 86

12. START UP (SERVICE) 87

12.1. OPERATING CONDITIONS 87
12.2. SEQUENCE FOR COMMISSIONING (NOT VALID FOR 1MASTER/N.SLAVE SYSTEMS) 88
12.3. SEQUENCE FOR COMMISSIONING THE 1MASTER/N.SLAVE SYSTEMS (INVERTER ≥165KW) 90

13. INTERACTIVE DISPLAY 92

13.1. How the display functions 92
13.2. Password entry 93
13.3. The display LED 93
13.4. Functional diagram of the display (Menu) 95
13.5. Information 99
13.5.1 ID. module 99
13.5.2 Mod. SeriesNo. 99
13.5.3 System ID 99
13.5.4 Sys. Series No. 99
13.5.5 Trafo type 99
13.5.6 Firmware 99
13.5.7 Junction Box (only on the module designated for control) 99
13.5.7.1 States 100
13.5.7.2 Fuses 100
13.5.7.3 Currents 100
13.6. Statistics 100
13.6.1 Timing 100
13.6.2 N. Conn (Number of Connections) 100
13.6.3 E-Tot 100
13.6.4 Partial 101
13.6.5 E-today 101
13.6.6 E-Week 101
13.6.7 E-Month 101
13.6.8 E-Year 101
13.6.9 Last N Days 101
13.6.10 Power Peak 101

14. BEFORE USING THE SOFTWARE 102

14.1. Software installation 102

15. MONITORING AND CONFIGURATION INTERFACE 103

15.1. Conventions used 103
15.1.1 Rack and Modules 103
15.2. Access levels 103
15.3. Diagram of the monitoring software 104
15.4. Use of the monitoring program 105
15.4.1 Single Module Panel 106
15.4.2 Plant Configuration 107
15.4.3 Rack Interface 110
15.4.4 Menus bar 111
15.4.5 Inverter Identification 112
15.4.6 Inverter Monitoring 113
15.4.7 Rack Monitoring 114
15.4.8 Fault Log 115
15.4.9 Statistic Field Reset 117
15.4.10 Inverter clock settings 118
15.4.11 String Comb monitoring 119

15.4.12 Solar field scan *120*
15.4.12.1 Loading and visualisation of the P-V curves saved *124*
15.4.12.2 Software Version *125*

16. MAINTENANCE / REPAIRS **126**

16.1. ROUTINE MAINTENANCE 127
16.1.1 Filter cleaning *127*
16.1.1.1 Filter of the Modules area *127*
16.1.1.2 ACBOX area filter *128*
16.1.2 Visual and screw inspections *129*
16.1.3 Checks of the ACBOX area *131*
16.1.3.1 Fan control *131*
16.1.3.2 Check of the power switch operation *131*
16.1.3.3 OVR AC device check. *132*
16.1.4 Checks on the Framework *132*
16.1.4.1 OVR DC device check. *132*
16.1.4.2 Check of the AC fuses *133*
16.1.4.3 Check of the DC fuses *133*
16.1.5 Check of warning cards and signalling devices *133*
16.2. REPLACEMENT OF FAULTY BATTERY 133

17. SWITCHING OFF AND DISCONNECTING THE SYSTEM **134**

17.1. DISCONNECTION FROM THE AC GRID 134
17.2. DISCONNECTING THE PHOTOVOLTAIC FIELD 135
17.3. DISCONNECTION FROM THE AUXILIARY LINE 135
17.4. UPSTREAM DISCONNECTION OF THE INVERTER 136
17.5. REMOVAL AND INSERTION OF A 55KWP MODULE 136
17.5.1 Preliminary operations *136*
17.5.2 Removing the module *136*
17.5.3 Insertion of the module *137*
17.5.4 Final operations *137*
17.6. REMOVAL AND INSERTION OF THE DC FUSES DRAWER 137
17.6.1 Initial operations *137*
17.6.2 Removal of the DC drawer *138*
17.6.3 Final operation *138*
17.7. REMOVAL AND INSERTION OF THE AC DRAWER (ONLY MODELS –TL) 139
17.7.1 Initial operations *139*
17.7.2 Partial extraction of the AC drawer *139*
17.7.3 Removal of the AC drawer *140*
17.7.4 Final operation *140*

18. SCRAPPING **141**

19. TROUBLESHOOTING **141**

19.1. FAQ (FREQUENTLY ASKED QUESTION) 141
19.2. BEFORE CONTACTING THE DEALER (QUESTIONNAIRE) 143
19.2.1 Problems on the StringCombs *143*
19.2.2 Problems on the PVI-XXX.0(-TL) *144*

20. ERROR MESSAGES AND CODES 145

20.1. WARNING 145
20.2. ERROR 145

21. TECHNICAL DATA 147

21.1. TECHNICAL DATA TABLES 147

22. DECLARATION OF CONFORMITY 154

23. CERTIFICATE OF CONFORMITY 155

INDEX OF FIGURES:

FIGURE 1-1: CE MARK AND CAUTION AND DANGER LABELS 13
FIGURE 1-2: IDENTIFICATION LABEL 14
FIGURE 3-1: ARRAY COMPOSITION 19
FIGURE 4-1: PVI-XXX.0 SERIES (WITH TRANSFORMER) 21
FIGURE 4-2: PVI-XXX.0-TL SERIES (WITHOUT TRANSFORMER) 21
FIGURE 4-3: EXAMPLE OF CONNECTION TO THE AC GRID OF THE INVERTER WITH TRANSFORMER ON BOARD 23
FIGURE 4-4: EXAMPLE OF CONNECTION TO THE AC GRID OF THE INVERTER WITHOUT TRANSFORMER ON BOARD 24
FIGURE 4-5: ELECTRICAL DIAGRAM OF MAXIMUM PVI-XXX.0 WITH TRANSFORMER ON BOARD (≤220KW) 26
FIGURE 4-6: ELECTRICAL DIAGRAM OF MAXIMUM PVI-XXX.0 WITH TRANSFORMER (VERSIONS 275KW AND 330KW) 27
FIGURE 4-7: ELECTRICAL DIAGRAM OF MAXIMUM PVI-XXX.0(-TL) WITHOUT TRANSFORMER (FOR ALL VERSIONS) 28
FIGURE 4-8: EXAMPLE OF I-V CURVES (CURRENT-VOLTAGE) AND P-V (POWER-VOLTAGE) OF A SOLAR PANEL 31
FIGURE 5-1: GENERAL OVERVIEW OF THE PVI-XXX.0 (VERSIONS 275KW AND 330KW) 32
FIGURE 5-2: GENERAL OVERVIEW OF THE PVI-XXX.0(-TL) (VERSIONS INFERIOR TO 220KW) 33
FIGURE 5-3: GENERAL VIEW OF ACBOX (A) (VERSIONS WITH TRANSFORMER ≤220KW) 34
FIGURE 5-4: GENERAL VIEW OF ACBOX (A) (VERSIONS WITH POWER ≥275KW OR WITHOUT TRANSFORMER) 34
FIGURE 5-5: DC CABLE INPUT (VERSIONS WITH TRANSFORMER ≤220KW) 35
FIGURE 5-6: AC CABLES INPUT (VERSIONS WITH TRANSFORMER ≤220KW) 35
FIGURE 5-7: AC AUXILIARY VOLTAGE INPUT (VERSIONS WITH TRANSFORMER ≤220KW) 36
FIGURE 5-8: SIGNAL INPUT/OUTPUT (VERSIONS WITH TRANSFORMER ≤220KW) 36
FIGURE 5-9: ACBOX-TRANSFORMER (VERSIONS WITH POWER ≥275KW WITH TRANSFORMER) 37
FIGURE 5-10: DC CABLES INPUT (VERSIONS WITH POWER ≥275KW OR WITHOUT TRANSFORMER) 37
FIGURE 5-11: AC CABLES INPUT (VERSIONS WITH POWER ≥275KW OR WITHOUT TRANSFORMER) 37
FIGURE 5-12: SIGNAL INPUT/OUTPUT (VERSIONS WITH POWER ≥275KW OR WITHOUT TRANSFORMER) 38
FIGURE 66-1: PVI-330.0-TL COMPOSITION (MULTI-MASTER) 40
FIGURE 6-2: PVI-220.0 COMPOSITION (MULTI-MASTER) 41
FIGURE 6-3: PVI-330.0(-TL) COMPOSITION (MULTI-MASTER-SLAVE) 41
FIGURE 6-4: PVI-110.0 COMPOSITION (MASTER-SLAVE) 41
FIGURE 6-5: PVI-330.0(-TL) COMPOSITION (1 MASTER-N.SLAVE) 42
FIGURE 6-6: PVI-220.0 COMPOSITION (1 MASTER-N.SLAVE) 42
FIGURE 6-7: FRAMEWORK - DETAILED ACTION ON DC SWITCHES 44
FIGURE 6-8: POSSIBLE SWITCH POSITIONS 44
FIGURE 8-1: PASSAGE MODE OF THE PVI-XXX.0 SERIAL CABLE 51
FIGURE 8-2: PASSAGE MODE OF THE PVI-XXX.0-TL SERIAL CABLE 51
FIGURE 8-3: TYPE OF CONNECTION OF THE PVI-XXX.0(-TL) 52
FIGURE 8-4: TYPE OF CONNECTION OF THE PVI-XXX.0(-TL) 52
FIGURE 8-5: CONNECTION MODES 53

FIGURE 9-1: TRANSPORT CRATE 57
FIGURE 9-2: DO NOT FORK UP FROM THE FRONT SIDE IF NOT REALLY NECESSARY 58
FIGURE 9-3: WOODEN BASE 58
FIGURE 9-4: CLOSURE MECHANISMS OF THE FRONT AND REAR BASE 59
FIGURE 9-5: NOT ALLOWED HANDLING 60
FIGURE 9-6: ALLOWED HANDLING 61
FIGURE 10-1: FOOTPRINT OF THE BASE (SIMILAR FOR ALL SYSTEMS) 64
FIGURE 10-2: CABLE PASSAGE HOLES FOR SYSTEMS WITH TRANSFORMER ≤220KW 64
FIGURE 10-3: CABLE PASSAGE HOLES FOR ≥275KW SYSTEMS AND ALL MODELS WITHOUT TRANSFORMER 65
FIGURE 10-4: AC CABLE PASSAGE FOR ≥275KW SYSTEMS "ACBOX-TRANSFORMER" 65
FIGURE 10-5: REAR VENTILATION GRILLS 66
FIGURE 10-6: HOT AIR OUTLET FAN FOR VERSIONS UP TO 110KW 67
FIGURE 10-7: SAFETY DISTANCE 68
FIGURE 10-8: EXAMPLE OF INSTALLATION 69
FIGURE 10-9: PANELS TO BE REMOVED 70
FIGURE 10-10: COMPOSITION OF THE ACBOX AREA (VERSIONS WITH ≤220KW TRANSFORMER) 71
FIGURE 10-11: COMPOSITION OF THE ACBOX AREA (VERSIONS WITH POWER ≥275KW OR WITHOUT TRANSFORMER) 71
FIGURE 10-12: CABLE OUTPUT UNDER THE INVERTER (VERSIONS ≥275KW) 72
FIGURE 10-13: CABLE OUTPUT UNDER THE INVERTER (VERSIONS WITHOUT TRANSFORMER) 72
FIGURE 10-14: CABLE OUTPUT UNDER THE INVERTER (VERSIONS ≤200KW) 73
FIGURE 11-1: DC CABLE CONNECTION (VERSIONS WITH POWER ≥275KW OR WITHOUT TRANSFORMER) 75
FIGURE 11-2: DC CABLE CONNECTION (VERSIONS ≤220KW WITH TRANSFORMER) 76
FIGURE 11-3: CONNECTION OF THE PROTECTION EARTH CABLE (PE) FOR ACBOX WITHOUT TRANSFORMER 77
FIGURE 11-4: CONNECTION OF THE PROTECTION EARTH CABLE (PE) FOR ACBOX WITH TRANSFORMER 77
FIGURE 11-5: CONNECTION OF THE AC POWER CABLES (VERSIONS WITH ≥275KW POWER OR WITHOUT TRANSFORMER) 78
FIGURE 11-6: CONNECTION OF THE AC POWER CABLES (VERSIONS WITH ≤220KW POWER) 78
FIGURE 11-7: CLAMPS FOR CONNECTING THE AUXILIARY AC GRID AND THE RELATIVE MAGNETOTHERMIC SWITCH (VERSIONS WITH POWER ≥275KW OR WITHOUT TRANSFORMER) 79
FIGURE 11-8: CLAMPS FOR CONNECTING THE AUXILIARY AC GRID AND THE RELATIVE MAGNETOTHERMIC SWITCH (VERSIONS WITH TRANSFORMER WITH POWER ≤220KW) 79
FIGURE 11-9: TWILIGHT RELAY (VERSIONS WITH ≤220KW POWER TRANSFORMER) 80
FIGURE 11-10: TWILIGHT 80
FIGURE 11-11: INTERNAL TERMINAL BLOCK ACBOX AREA 81
FIGURE 11-12: SWITCH POSITION OF THE 120 OHM TERMINATION 83
FIGURE 11-13: SWITCH POSITION OF THE 120 OHM TERMINATION 84
FIGURE 11-14: AUX CONTACT FOR STATE SIGNALLING 85
FIGURE 12-1: INVERTER'S OPERATION DIAGRAM 87
FIGURE 13-1: DISPLAY OF THE 55KWP MODULE 92
FIGURE 13-2: FUNCTIONAL DIAGRAM OF THE DISPLAY (MAIN MENU) 95
FIGURE 13-3: FUNCTIONAL DIAGRAM OF THE DISPLAY (SETTING MENU) 96
FIGURE 13-4: FUNCTIONAL DIAGRAM OF THE DISPLAY (INFORMATION MENU) 97
FIGURE 13-5: FUNCTIONAL DIAGRAM OF THE DISPLAY (STATISTICS MENU) 98
FIGURE 15-1: SOFTWARE MAP OF MONITORING THE 104
FIGURE 15-2: CHOICE OF THE INTERFACE TYPE 105
FIGURE 15-3: CHOICE OF STANDARD OR ADVANCED MODE 105
FIGURE 15-4: SINGLE MODULE PANEL 106
FIGURE 15-5: PLANT CONFIGURATION 107
FIGURE 15-6: CHOICE OF THE STRINGCOMB MANAGER 108

FIGURE 15-7: DISPLAY OF SOLAR MONITORING 109
FIGURE 15-8: RACK INTERFACE – RACK MANAGEMENT 110
FIGURE 15-9: INVERTER ID – SINGLE MODULE INTERFACE 112
FIGURE 15-10: INVERTER MONITORING 113
FIGURE 15-11: RACK MONITORING 114
FIGURE 15-12: WINDOW FOR SAVING THE FAULT LIST 115
FIGURE 15-13: WINDOW FOR SAVING THE FAULT LIST 115
FIGURE 15-14: FAULT LOG 116
FIGURE 15-15: EEPROM RESET 117
FIGURE 15-16: INVERTER CLOCK SETTINGS 118
FIGURE 15-17: STRINGCOMB MONITORING 119
FIGURE 15-18: SOLAR FIELD SCAN 123
FIGURE 16-1: FRONT FILTER PANEL "55KWP MODULE AREA" 127
FIGURE 16-2: REMOVAL OF FILTER "55KWP MODULE AREA" 128
FIGURE 16-3: FRONT FILTER PANEL "ACBOX AREA" 128
FIGURE 16-4: REMOVAL OF FILTER "ACBOX AREA" 129
FIGURE 16-5: PANELS TO BE REMOVED TO ACCES DC AND AC FUSES. 130
FIGURE 16-6: THERMOSTAT 131
FIGURE 16-7: OVR AC DEVICES FOR VERSIONS ≤220KW WITH TRANSFORMER 132
FIGURE 16-8: OVR AC DEVICES FOR VERSIONS WITHOUT TRANSFORMER OR ≥275KW 132
FIGURE 16-9: OVR DC DEVICES 132
FIGURA 17-1: CONNECTION OF THE DC DRAWER TO THE BOARD 138
FIGURA 17-2: DC DRAWER HOLDING SCREWS 138
FIGURA 17-3: DC DRAWER 138
FIGURA 17-4: HOLDING SCREWS OF THE AC DRAWER 139
FIGURA 17-5: MAINTAINANCE POSITION OF THE AC DRAWER 139
FIGURA 17-6: AC DRAWER 140

INDEX OF TABLES:

TABLE 6-1: ADMITTED OPERATIONS AND POSITION OF THE DC SWITCHES 45
TABLE 6-2: ADMITTED OPERATIONS AND POSITION OF THE DC SWITCHES 46
TABLE 6-3: ADMITTED OPERATIONS AND POSITION OF THE DC SWITCHES 47
TABLE 10-1: TABLE OF RECOMMENDED DISTANCES* 68
TABELLA 11-1: TABEL OF THE MINIMUM RECOMMENDED DIMENSIONS FOR THE GROUNDING CABLES 77
TABLE 11-1: COMMUNICATION SIGNALS IN THE TERMINAL BLOCK 82
TABLE 11-2: STATE SIGNALS IN THE TERMINAL BLOCK 82
TABLE 11-3: CONTROL SIGNALS IN THE TERMINAL BLOCK 82
TABLE 13-1: MEANING OF THE DISPLAY LEDS 94
TABLE 16-1: TABLE OF ROUTINE MAINTENANCE 127
TABLE 16-2: TABLE OF VISUAL AND SCREW CHECKS 130
TABLE 19-1: TROUBLESHOOTING 142
TABLE 20-1: TABLE OF ERROR MESSAGES AND CODES 146
TABLE 21-1: TECHNICAL DATA PVI-55.0(-TL) 148
TABLE 21-2: TECHNICAL DATA PVI-110.0(-TL) 149

1. HOW TO USE AND READ THE MANUAL

- The product covered by this Manual shall be used solely for the use described in the Manual itself. Any other use is considered improper and therefore dangerous. Power-One declines any liability for damage to property or persons due to inappropriate use and/or other use than the intended one.

Chapter §4

- Before replacing the components in the device and mentioned in this Manual, with particular reference to dischargers and fuses, contact the dealer. Power-One shall not be liable for damages consequent to the use of inappropriate spare parts.

- Power-One reserves the right to make changes to this Manual and to the product without prior notice: the latest version of the Manual indicating the revision number will be available soon on the site (www.power-one.com).

- The figures are for orientative information and some details may not exactly correspond to the product referred to in this manual.

- This Manual describes all equipment and models. Some models and versions are not marked as such. It is therefore possible that the product you have may not be endowed with certain equipment.

- This Manual contains important safety and operation instructions that must be understood and accurately followed during the installation and maintenance of the product.

1.1. Disposal of waste

As a manufacturer of the electrical device described in this Manual and in compliance with Italian Legislative Decree No. 151 of 25 July 2005, Power One informs the customer that this product, when scrapped, must be delivered to an authorised collection point.

1.2. Symbols used with the product

The symbols referring to the electrical parts of the device and that may also be used in this Manual are the following:

⏚	**Connection point for earth conductor**
+	**Continuous positive voltage pole**
-	**Continuous negative voltage pole**
⎓	**Direct current (VDC)**
⏚	**Earthing (GRD)**

1.3. Labels used with the product

Make sure that you have read and fully understood the labels before installing the product. The device is provided with several labels, some of them with yellow background related to safety devices.

power-one
Made in Italy
CE
INVERTER FOTOVOLTAICO
PER ALLACCIAMENTO ALLA RETE ELETTRICA
MODELLO: PVI-CENTRAL-50-IT
DATI DI TARGA, DC
Max. Tensione di Sistema: 900 V
Tensione Operativa Nominale: 550 V
Intervallo della Tensione Operativa: 465-850 V
Max. Corrente Operativa: 124 A
Max. Corrente di Corto Circuito (Pannelli PV): 125 A
DATI DI TARGA, AC
Tensione Operativa: 400 V~ 3
Frequenza Operativa: 50 Hz
Max. Corrente di Uscita (rms): 81 A
Max. Potenza di Uscita @ 45° C: 55 kW
Max. Protezione per Sovra-corrente: 160 A
CAUTION!
Risk of electric shock.
Both AC and DC voltage
sources are terminated
inside this equipment.
Each circuit must be
individually disconnected
and the service person
must wait 5 minutes before
servicing.
When the photovoltaic
array is exposed to light,
it supplies a DC voltage
to this equipment.

Figure 1-1: CE mark and Caution and Danger labels

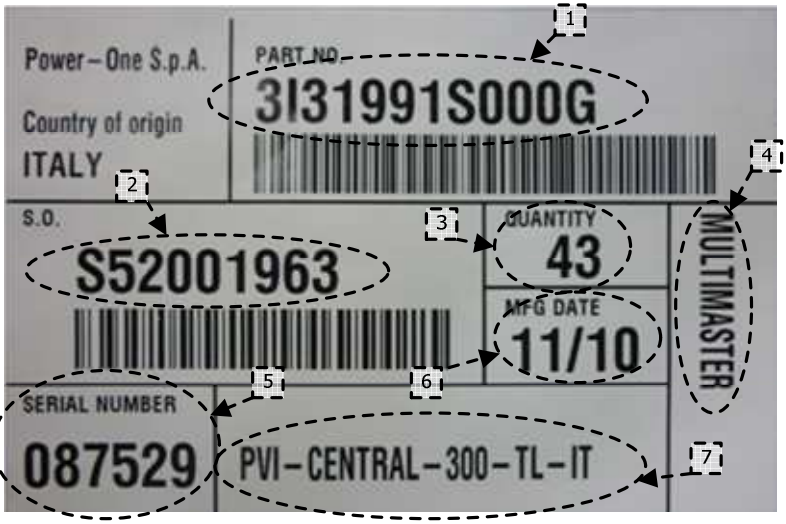


Figure 1-2: Identification label

1. Generic code “Part Number”
2. Serial order
3. Serial order total quantity
4. Shipping configuration
5. Serial Number
6. Production date
7. General description of the product

1.4. Documents provided with the device

- This Manual
- Test Certificate
- CD

2. IMPORTANT SAFETY INFORMATION

NOTICE

The installation of the PVI-XXX.0(-TL) must be performed in compliance with national and local regulations.
We strongly recommend to read all instructions in this Manual and notice the symbols of the single paragraphs before installing or using the product.

NOTICE

For each type of maintenance or repair (non covered in this manual), please contact the dealer. Prohibited changes may damage the device and things in general, causing the loss of product warranty.

NOTICE

Electrical connections must always be made correctly and with the correct polarity in order to avoid possible damage to the device and the photovoltaic panels.

WARNING

The connection to the distribution grid should be made only after receiving approval from the Body responsible for electricity distribution, as required by national regulations in force and can be done exclusively by a qualified personnel.

We recommend using appropriate tools

WARNING

In case of failure, an electric arc may have been produced within the PVI-XXX.0(-TL), supported by the DC source. At worst, this may even damage carpentry, with possible presence of smoke, and thus being a danger to persons and property.
Carefully follow all instructions in this Manual, paying particular attention to the chapter about installation.

Chapter §10

DANGER

The personnel operating inside the PVI-XXX.0(-TL), or removing the protections on live parts, must wear suitable personal protection equipment. The inverter is connected to the photovoltaic field and to the distribution grid, and is therefore energised. Do not remove the panels and/or any other protection, unless authorised by the plant manager. Removal of these protections exposes the person to possible electric shock hazards.

We recommend using appropriate tools

DANGER

It is extremely important and opportune to disconnect the inverter prior to its connection to the photovoltaic field (installation and/or maintenance) by means of the DC switch within the device, as there may be voltages that can result in serious hazard situations. Strings may be disconnected by means of the AURORA PVI-STRINGCOMB string combiner (if present).

We recommend using appropriate tools

2.1. General Information

NOTICE

Inappropriate use and/or incorrect installation can cause serious damage to persons or property. All operations concerning transport, installation and switch on, including maintenance, must be carried out by a qualified and trained personnel, possessing the skills necessary to perform the required tasks (all national standards for the prevention of accidents must be observed).

WARNING

The installer is encharged with the completion of all tests and measures to ensure the adequacy of the final plant, in accordance with the laws and directives in force, and the applicable regulations, including the EN 50178 standard. Failure to comply involves the decline of any form of warranty and liability by Power-One. Records of the tests performed during installation shall be kept available for subsequent inspections and for the purposes intended by the standards and laws in force.
Power-One assumes no liability for damage to persons and property due to incorrect interpretation of the instructions in this Manual or from improper use of the device.

3. GENERAL INFORMATION AND FEATURES OF A PHOTOVOLTAIC SYSTEM

The purpose of this chapter is to provide the user of "AURORA PVI-XXX.0 (-TL)" general information concerning the photovoltaic systems that transform solar energy into electrical energy, usable in the distribution grid.

3.1. Photovoltaic energy

In the process of energy conversion, for many years, industrial companies (great energy consumers) have been experimenting with forms of energy saving and lower emission of pollutants, through a prudent and rational use of known resources and the research of new forms of clean and inexhaustible energy.

Renewable energy sources provide a major contribution to solving the problem. In this context, the exploitation of solar energy to generate electricity (photovoltaic) is becoming increasingly important worldwide.
Photovoltaic energy represents an enormous advantage in terms of environmental protection because the solar radiation we receive from the sun is directly converted into electricity without any combustion process and without the production of nature-polluting waste.

Photovoltaic panels convert the energy radiated by the sun into electrical energy of "DC" type (by means of a photovoltaic field, also called a PV generator). In order to supply the distribution grid so this electricity can be used, it should be converted into alternating current "AC". This conversion, known as DC to AC conversion, is carried out efficiently by the AURORA inverters without the use of rotating elements, but only by means of static electronic devices.

When used in parallel with the grid, the alternating current output from the inverter flows directly through the insulation transformer (where required) into the industrial distribution circuit, connected in turn to the public distribution grid.
If the supply from the photovoltaic field is low, the amount of energy necessary to guarantee the normal operation of the connected appliances is taken from the public distribution grid. However, if the opposite occurs, i.e. a surplus of energy is produced, it is directly introduced in the grid, thus becoming available for other users.

In compliance with local and national regulations, the energy produced can be sold to the distribution grid or credited against future consumption, thus producing energy savings.

3.2. Fundamental elements of the photovoltaic field: “Strings” and “Arrays”

In order to significantly reduce installation costs of the photovoltaic field, especially related to the wiring problem on the inverter DC side and the subsequent distribution on the AC side, the STRING technology was developed.
A photovoltaic PANEL is made up of many photovoltaic cells mounted on the same support base. A STRING is made up of a certain number of panels connected in series. An ARRAY is made up of one or more strings connected in parallel.
Large photovoltaic systems may be made up of several arrays, connected to one or more AURORA inverters.
Maximizing the number of panels in each string, the cost and complexity of the connection systems of the plant may be reduced.

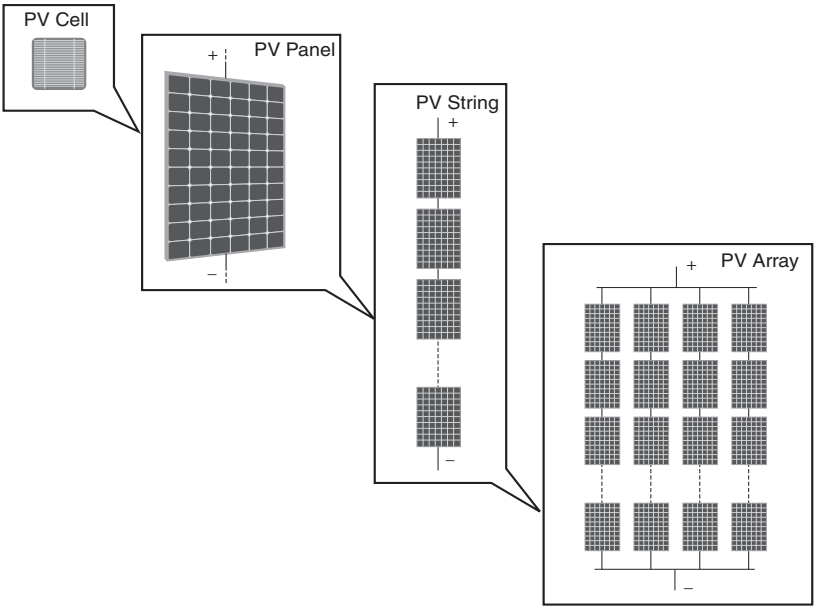


Figure 3-1: Array Composition

NOTICE

In no case should the voltage of the string exceed the maximum permissible voltage, in order to avoid damage to the device.

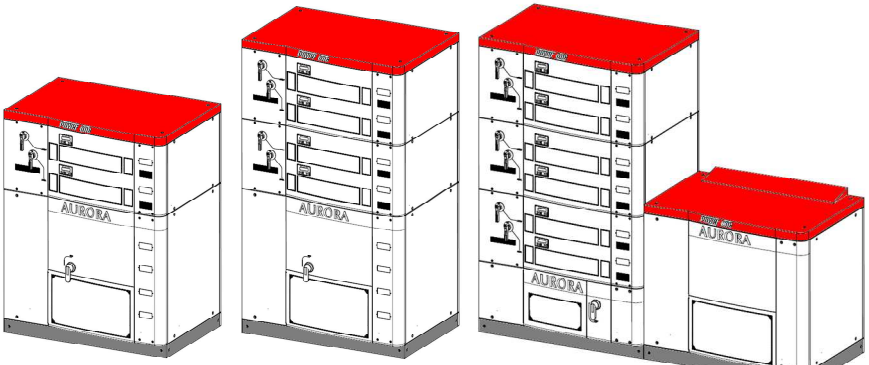
Chapter §21

The current value of each "array" must also be within the limit values of the inverter located downstream.

Decisions on how to structure a photovoltaic system depend on a number of factors and considerations to be made, such as the type of panels, the available space, the future location of the system, long-term energy production targets, etc.

On the Power-One website (www.power-one.com) a configuration program is available, that can help with the correct dimensioning of the photovoltaic system.

4. SCOPE AND GENERAL DESCRIPTION OF THE PRODUCT

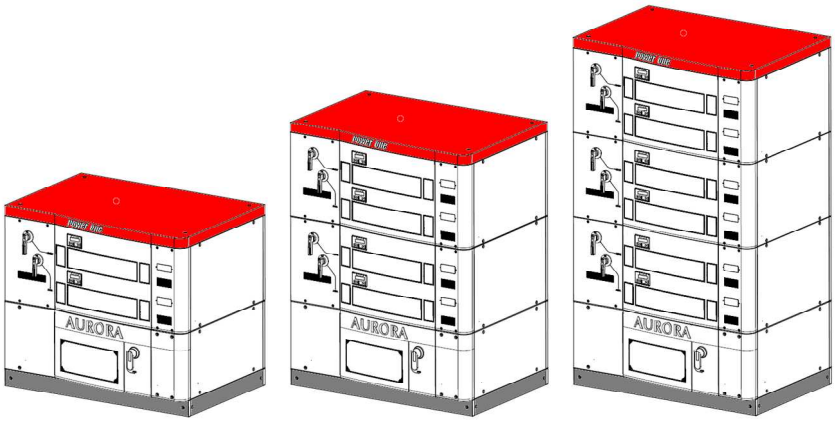


PVI-110.0
PVI-55.0

PVI-220.0
PVI-165.0

PVI-330.0
PVI-275.0

Figure 4-1: PVI-XXX.0 Series (WITH TRANSFORMER)



PVI-110.0-TL
PVI-55.0-TL

PVI-220.0-TL
PVI-165.0-TL

PVI-330.0-TL
PVI-275.0-TL

Figure 4-2: PVI-XXX.0-TL Series (WITHOUT TRANSFORMER)

The PVI-XXX.0(-TL) (Figure 4-1 and Figure 4-2) are devices designed exclusively for converting solar energy into electricity compatible with the grid of the country where it is marketed. They are also equipped with adequate electrical and mechanical protection.

If the inverters are connected to string combiners (AURORA PVI-STRINGCOMB), they also allow the monitoring of the entire photovoltaic field, via the following inspections:

- Reading the string currents (10 channels available)
- Reading the total voltage of the field
- Checking the functioning of the inside fuses, to protect the photovoltaic panels.
- Other functions.

AURORA PVI-XXX.0(-TL) is a device that can feed the electricity grid with energy from the photovoltaic panels.

Chapter §3

When used in parallel with the grid, the inverter alternating current output flows through the insulation Transformer (where required) in the industrial distribution circuit, connected in turn to the public distribution grid (Figure 4-3 and Figure 4-4).

For the connection to the MT electrical grid described in Figure 4-4, for models “TL”, i.e. without insulation Transformer, the use and installation of a Transformer (by the person who makes the plant) is mandatory “dedicated” of MT/BT type, based on the electrical features of the used inverter model. The instructions for the dimensioning of the external Transformer are indicated below.

- MT side (medium voltage): reference to grid features.
- BT side (low voltage): reference to output electrical features of the PVI-XXX.0(-TL) device.

Chapter §21

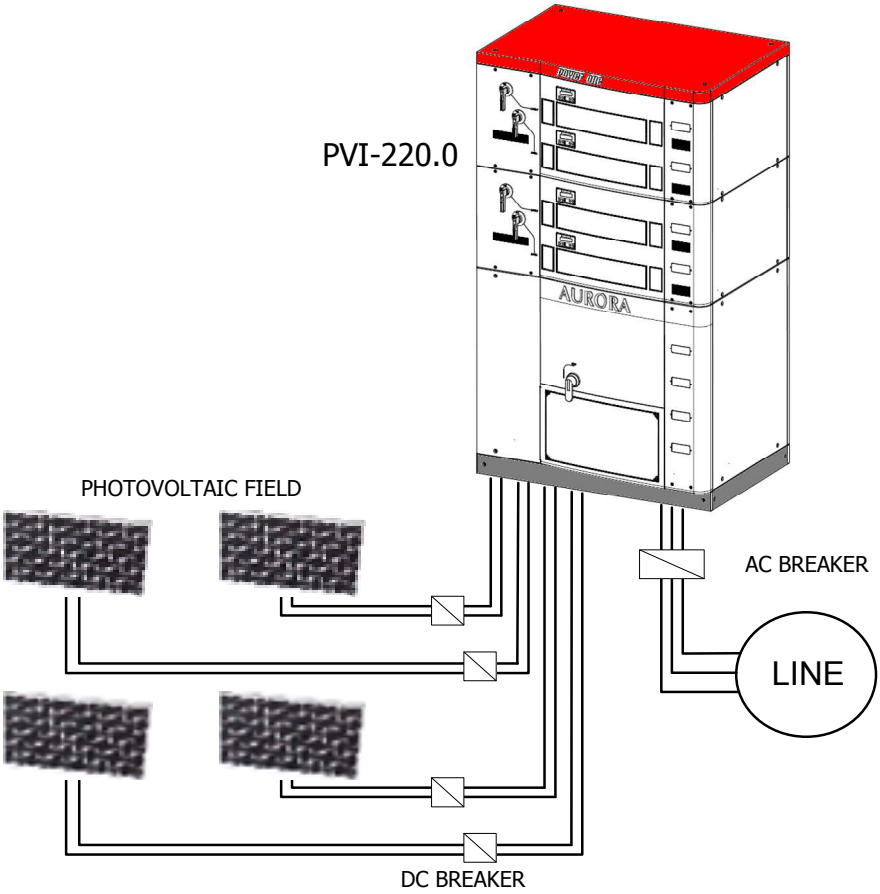


Figure 4-3: Example of connection to the AC grid of the inverter with Transformer on board

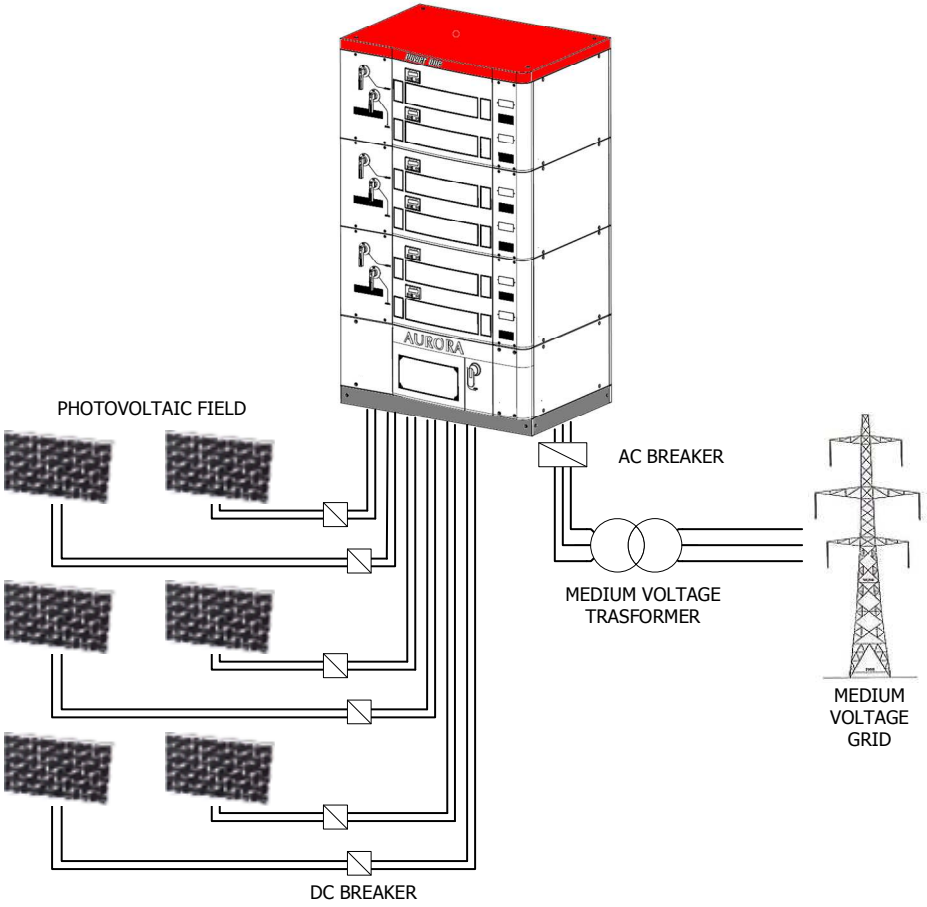


Figure 4-4: Example of connection to the AC grid of the inverter without Transformer on board

4.1. Technical Description of AURORA PVI-XXX.0(-TL)

Figure 4-5 shows the block diagram of AURORA PVI-220.0-YY.
For models with low power (165kW, 110kW, 55kW), the block diagram is similar but with less number of 55kWp modules.

Figure 4-6 shows the block diagram of AURORA PVI-330.0-YY.
For the model with 275kW power, the block diagram is similar but with a different number of 55kWp modules. In this case, the insulation Transformer is not provided on board of the device but with a tileable mechanical housing. (Figure 4-1)

Figure 4-7 shows the block diagram of AURORA PVI-330.0-YY-TL.
For models with low power (275kW, 220kW, 165kW, 110kW, 55kW), the block diagram is similar but with less number of 55kWp modules.

Depending on the versions, the system may or may not be provided with the galvanic insulation Transformer between input and output. The absence of the transformer (TL versions) allows for a further increase in the efficiency of the conversion system.

What are “MODULES”?
They are the DC/AC converters of 55kW and are the core of AURORA PVI-XXX.0(-TL). All converters function at high switching frequency (18kHz), taking up relatively little space and a fairly low weight, facilitating maintenance.

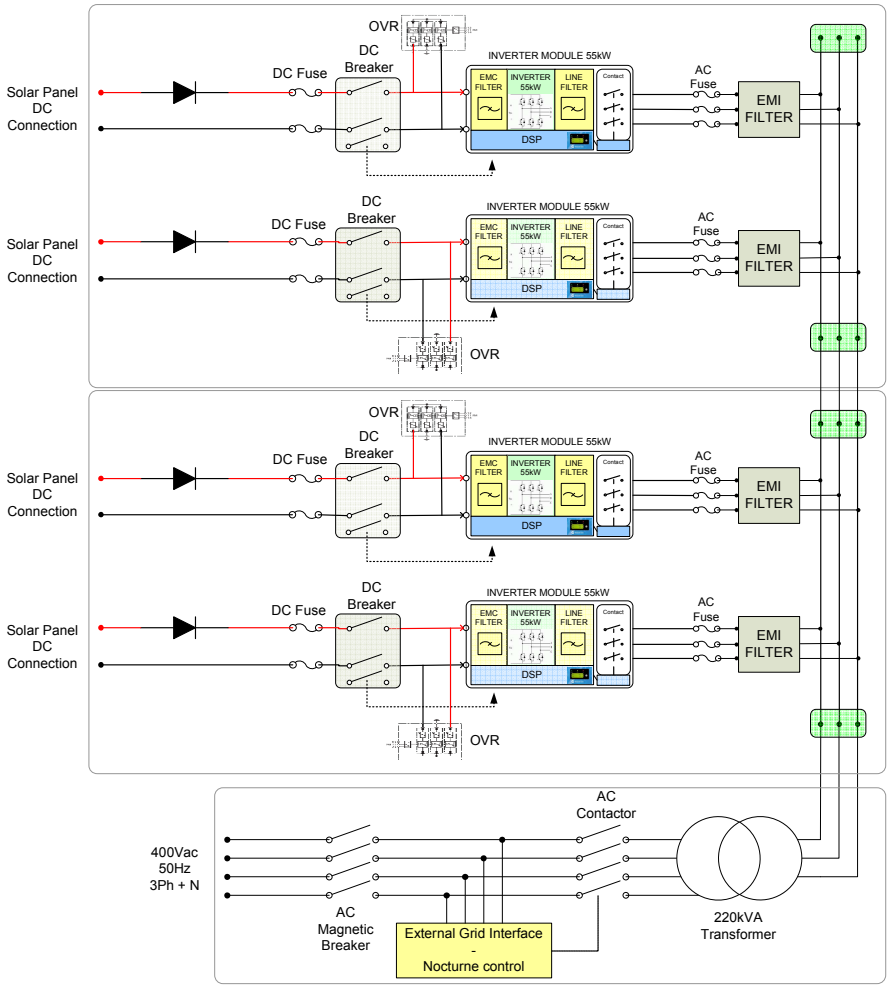


Figure 4-5: Electrical diagram of maximum PVI-XXX.0 with Transformer on board (≤220kW)

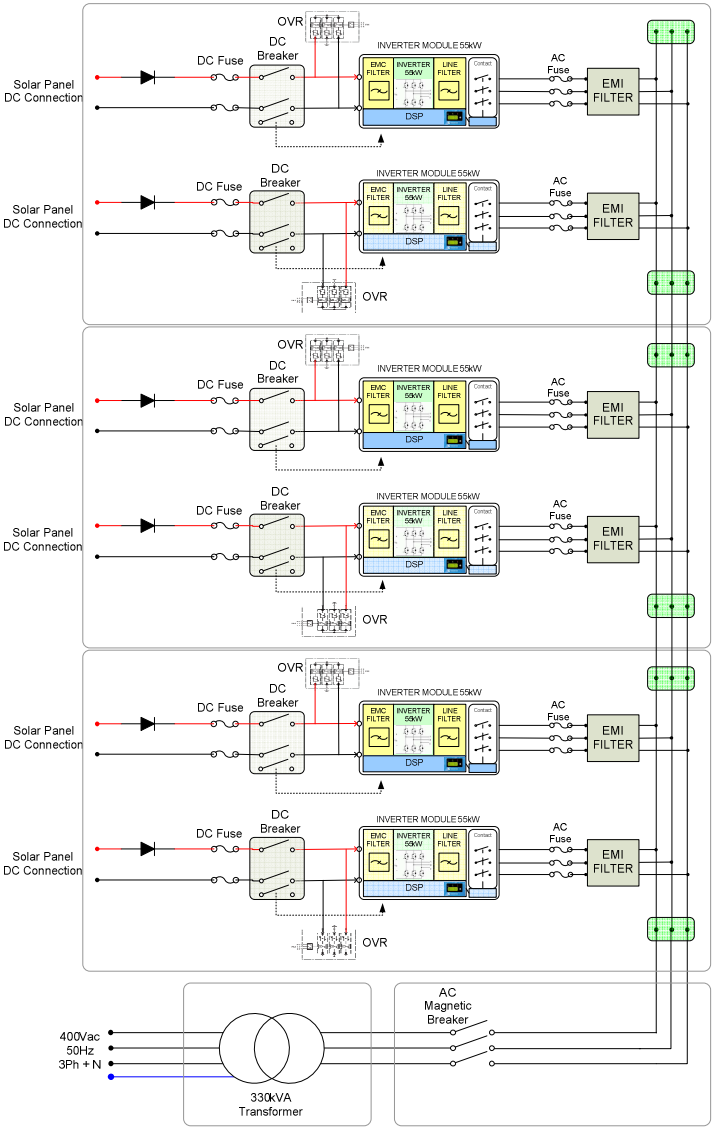


Figure 4-6: Electrical diagram of maximum PVI-XXX.0 with Transformer (versions 275kW and 330kW)

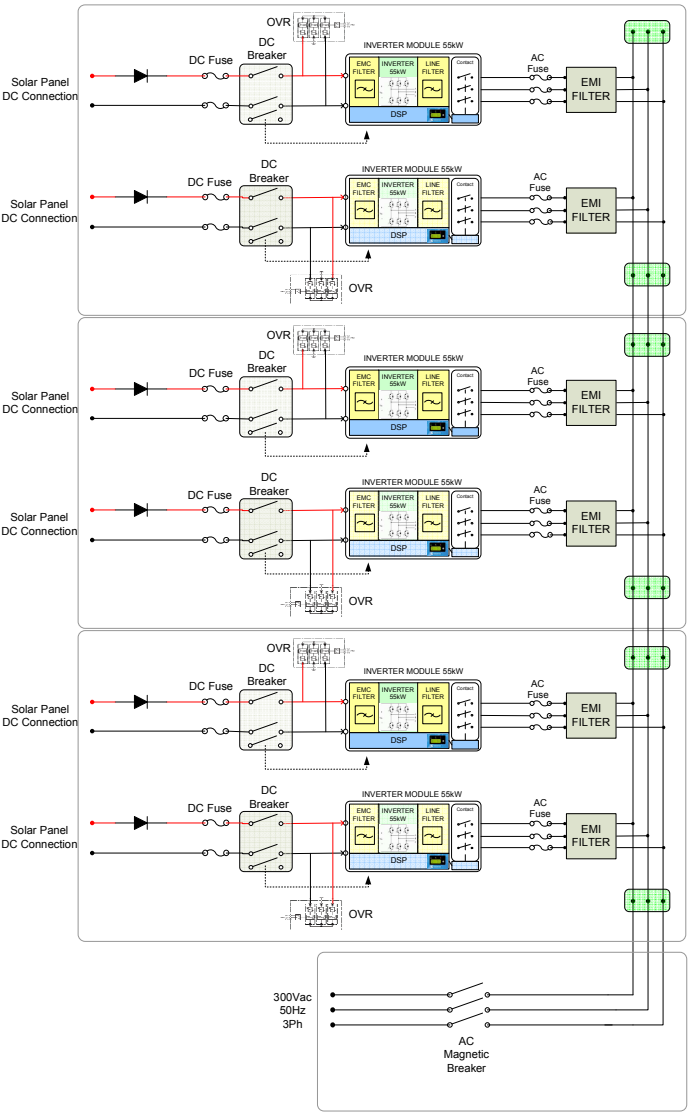


Figure 4-7: Electrical diagram of maximum PVI-XXX.0(-TL) without Transformer (for all versions)

The block diagram of Figure 4-5 shows the AURORA PVI-220.0 model with its 4 independent converters (Multi-Master mode).

The block diagram of Figure 4-6 shows the AURORA PVI-330.0 model with its 6 independent converters (Multi-Master mode).
The Transformer is usually connected to the inverter output as shown. The customer must introduce an appropriate protection magneto-thermal breaker.

We recommend the use of switches with magnetic shielding of at least 6000A and a nominal current of 480A.

The converters can operate in three different modes configured in the factory before delivery and according to customer requirements: Multi-Master, Multi-Master/Slave and 1Master/N.Slave.

4.1.1 Multi-Master

In Multi-Master mode, each converter is dedicated to a separate array (the photovoltaic fields connected to each module must be isolated from each other). In this case the maximum power point tracker (MPPT) is independently controlled. This means that the arrays can be installed with different positions and facing different directions.

Chapter §6.1.1

4.1.2 Multi-Master/Slave

The Multi-Master/Slave mode, where the Master/Slave[1] Framework controls the maximum power point tracker (MPPT), is possible only by properly configuring the DC input section.

Chapter §6.1.2

In this case, the fields connected to each Framework have the same polarity.

4.1.3 1Master/N.Slave (Inverter ≥ 150kW)

The 1Master/N.Slave mode, where a single Master controls the maximum power point tracker (MPPT), is possible only by properly configuring the DC input section.

Chapter §6.1.3

In this case, the fields connected to the entire device have the same polarity.

[1] For the definition of Framework.

Chapter §5.2.5

NOTICE

These modes may be carried out by configuring the entire device and each Framework accordingly. Taking in consideration that the larger system has 330kW of power, there will be three independent Frameworks of 110kW configured as Master/Slave if *Multi-Master/Slave*, while there will be 1 “Master” module and 5 “Slave” modules if *1Master/N.Slave*.
This mode requires, however, that the operation of DC input switches be well understood.

Chapter §6.2

4.1.4 MPPT (Maximum Power Point Tracker)

The great advantage in using the PVI-XXX.0 (-TL) is the ability to extract maximum power from the solar panels, regardless of environmental conditions.
A photovoltaic panel shows the curves of current-voltage (I-V in bold) and power-voltage (P-V) illustrated in Figure 4-8.
An array, therefore, has the same characteristic. The highest point is the maximum power. This point of the feature varies continuously depending on the level of solar radiation hitting the surface of cells.

On days with variable cloudiness, solar power changes occur very fast and wide-ranging.
Variations between 100W/m² and 1200 W/m² can be easily detected in about 2 seconds.

AURORA PVI-XXX.0(-TL) is designed to extract maximum power from the array it is connected to, thus it will always work in the "knee" of the Voltage-Power curve.
Moreover, since the device in question has fast tracking / settling periods, especially on variable days it may produce much more energy than a "slow" inverter.

PVI-XXX.0(-TL) scans the photovoltaic field at each connection, allowing to discover any possible multiple power peaks in the field characteristic. In this way, the inverter is placed immediately on the highest peak.

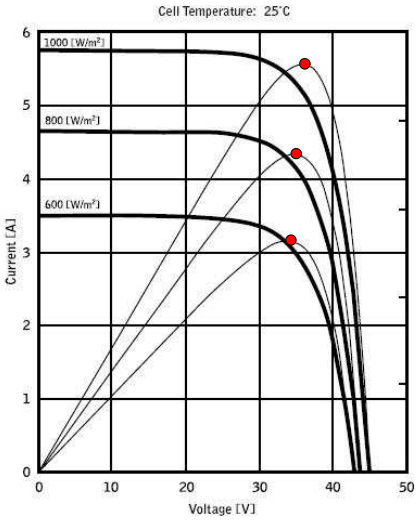


Figure 4-8: Example of I-V curves (Current-Voltage) and P-V (Power-Voltage) of a solar panel

Unlike other inverters, PVI-XXX.0(-TL) follows very fast variations in illumination, allowing the MPPT system to follow the light practically in real time.

4.1.5 Special features

Due to the high efficiency of AURORA and the system of heat dissipation amply sized, this inverter ensures operation at maximum power over a wide ambient temperature range.

Chapter §21

The inverter is controlled in each module by a DSP (Digital Signal Processor) and by a central microprocessor. This means that the failure of a module does not compromise the whole system but only the loss of up to 55kWp. This applies in a Multi-Master system, while in a Multi-Master/Slave system, in case of failure of the Master, undetectable by the Slave module, the system loses 110kWp, while in case of failure of Master detected by the Slave module it loses up to 55kWp.

The dialogue between DSP and the Microprocessor occurs via a CAN BUS communication. The same protocol is used for dialogue between modules belonging to the same system but with different Frameworks. This guarantees optimum operation of the entire device and a high performance in all insulation and load conditions, always in full compliance with its relative guidelines, standards and regulations.

For the communication of the system with the exterior, the inverter has two independent RS485 serial ports: a channel for user communication and a dedicated channel for the PVI-STRINGCOMB string combiners.

Chapter §8

5. DESCRIPTION OF COMPONENTS AND COMPOSITION OF THE PVI-XXX.0(-TL)

5.1. Overview

Figure 5-1 shows the main components of the PVI-XXX.0 for versions 275kW and 330kW with the insulation Transformer. If a non-isolated device shall be required, only the main “Tower” will be present, without the “ACbox-Transformer” section on the right.
The main feature of these models is the presence of three overlaying "FRAMEWORK" frames (E) to contain five or six "MODULES 55kW" power modules.

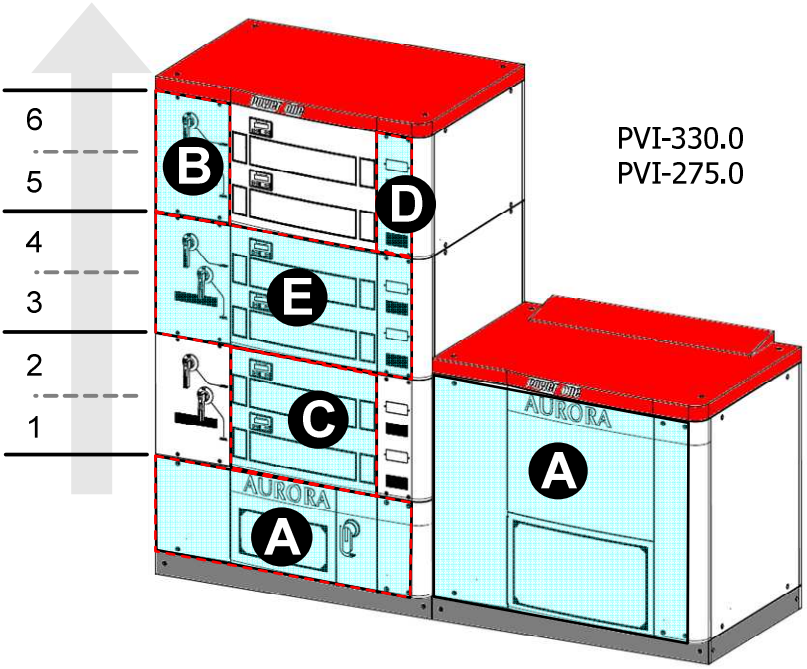


Figure 5-1: General overview of the PVI-XXX.0 (versions 275kW and 330Kw)

For power versions equal to 165kW or 220kW, the device with the insulation Transformer is presented as in Figure 5-2(l.h.), while the device without Transformer is like in Figure 5-2(r.h.). As can see in the figure we have two Frameworks (E) each containing three or four 55kW modules. For lower power models: 55kW to 110kW the shape of the device is equal but it contains only one Framework (E).

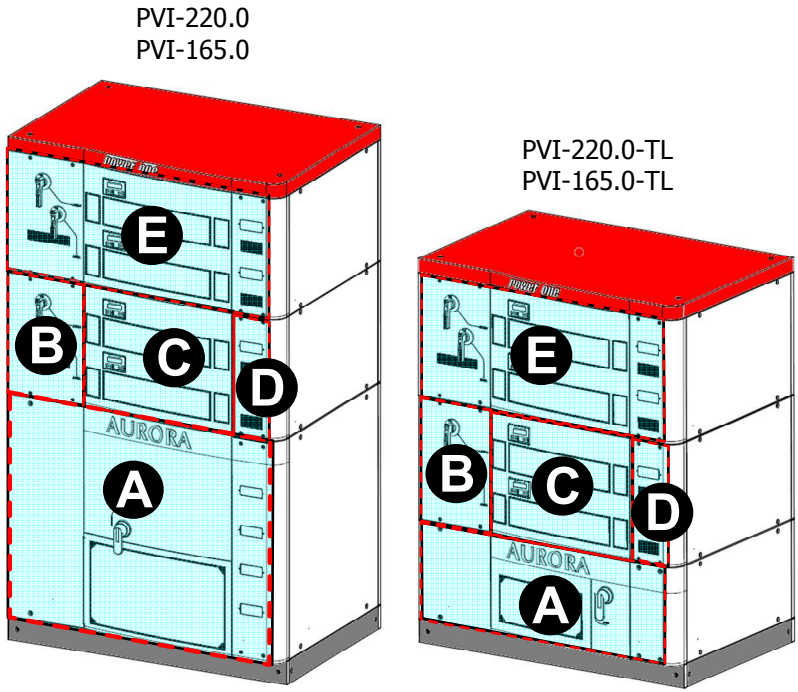


Figure 5-2: General overview of the PVI-XXX.0(-TL) (versions inferior to 220kW[1])

Practically, for powers less than or equal to 220kW, the difference between models with and without Transformer is in the carpentry of the inferior area of the device called "ACBOX" (A) and the presence or not of the Transformer.

[1] 165kW and 220kW versions have two frameworks, thus are higher.

5.2. Description of the inverter parts

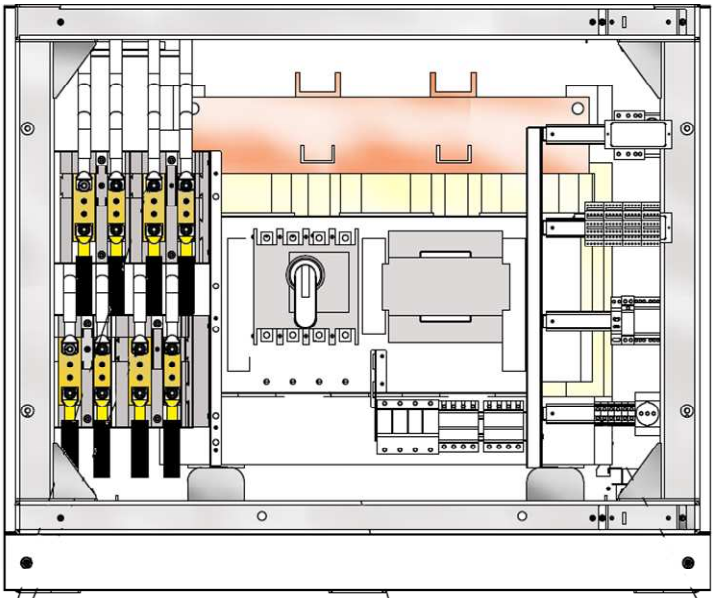


Figure 5-3: General view of ACBOX (A) (versions with Transformer ≤220kW)

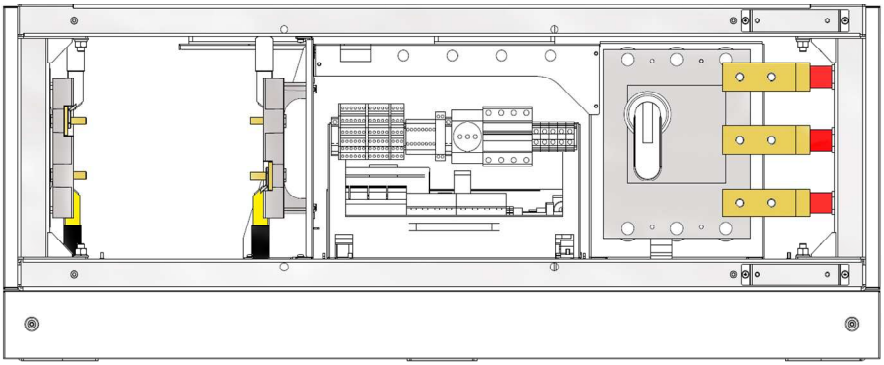


Figure 5-4: General view of ACBOX (A) (versions with power ≥275kW or without Transformer)

5.2.1 ACBOX (A)

5.2.1.1 Version until 220kW with Transformer

The connection area of the DC cables from the photovoltaic field is located (with frontal view) on the left side of the "ACBOX".
Positive inputs are in the lower part and negative inputs are in the upper part. The correspondent numeration of the "55kW MODULES" goes from right (module 1) to left (module 4). For ≤110kW versions there are only two connection bars (starting from right) instead of four.

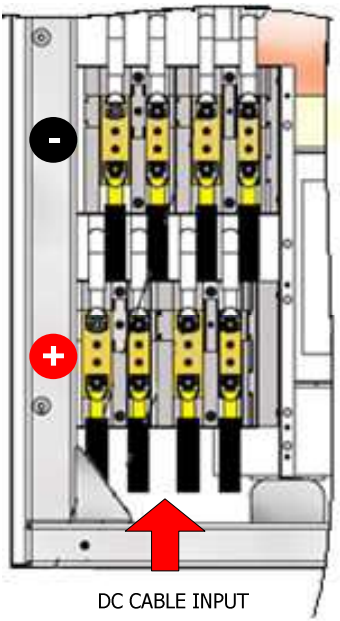


Figure 5-5: DC Cable Input (versions with Transformer ≤220kW)

The insulation Transformer (with frontal view) remains on the back side of the "ACBOX".
The cooling system consisting of four fans for models 220kW and 165kW (with frontal view) remains in the rear above the Transformer. For the 110kW model there are three fans while for the 55kW model there are two.
The magneto-thermal AC grid disconnecting switch with connection bars and the Contactor are in the centre of the "ACBOX".

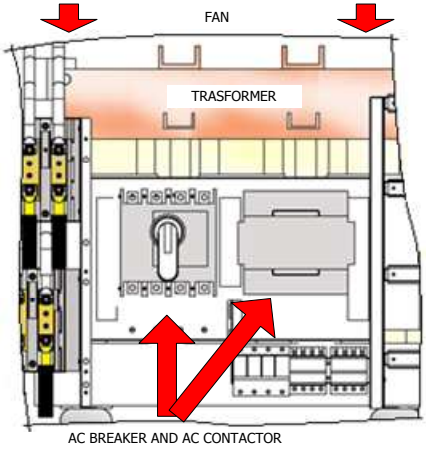


Figure 5-6: AC Cables Input (versions with Transformer ≤220kW)

The front panel has a removable and washable filter.

Chapter §16.1.1.2

The auxiliary AC power input is located on the right bottom of the "ACBOX".

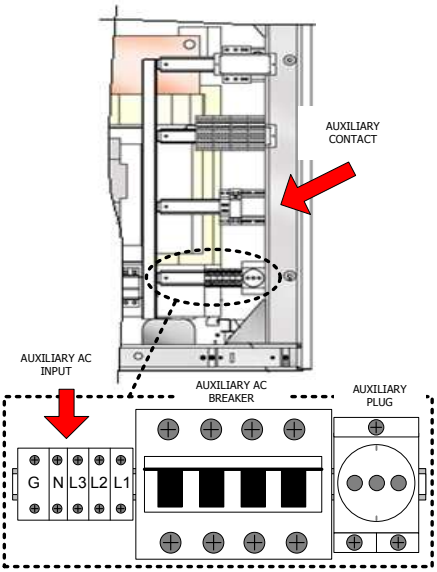


Figure 5-7: AC Auxiliary Voltage Input (versions with Transformer ≤220kW)

In the central part of the terminal block there are the control/protection devices.

- AC grid magneto-thermal.
- Twilight switch.
- GROUND-FAULT control device.
- Others.

The terminal block for serial communication links and various signals (frontal view) is located on the right top side of the "ACBOX".

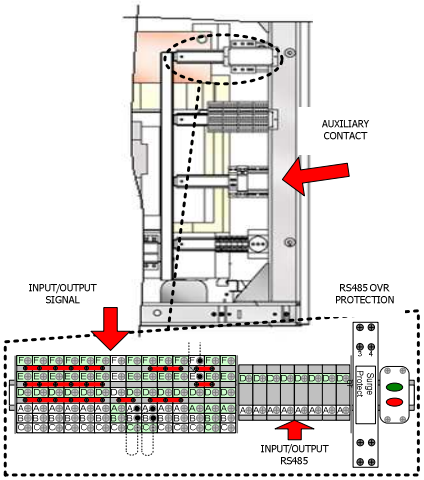


Figure 5-8: Signal Input/Output (versions with Transformer ≤220kW)

The area of the terminal block for the auxiliary voltage input, the serial and the control/protection devices are visible through special control windows located on the front panel.

5.2.1.2 Version ≥275kW and all models without insulation Transformer

For the models with Transformer, the "ACBOX" area Figure 5-1(A) is divided in two parts. The part containing the Transformer "ACbox-Transformer" is separated from the tower and contains the cover and the dedicated cooling system with a thermostat and five fans (Figure 5-9).

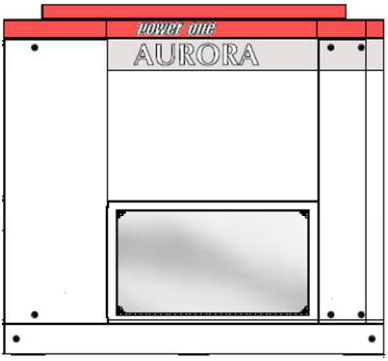


Figure 5-9: ACbox-Transformer (versions with power ≥275kW with Transformer)

All other parts are located in the bottom area of "ACBOX-TL" represented in Figure 5-4.

The connection area of the DC cables from the photovoltaic field is located on the left side of the "ACBOX-TL". Positive inputs are on the left side and negative inputs on the right side (Figure 5-10). The correspondent numeration of the "55kW MODULES" goes from the first outermost (module 1) to the last innermost (module 6). For the 165kW and 220kW versions, 4 connection bars are present. For the ≤110kW versions, 2 connection bars are present.

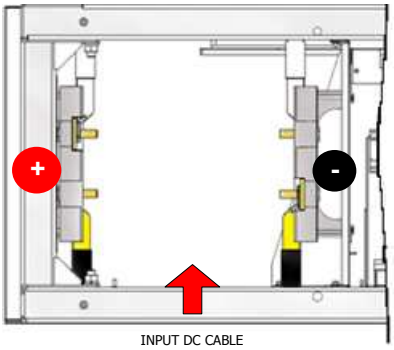


Figure 5-10: DC Cables Input (versions with power ≥275kW or without Transformer)

The magneto-thermal AC grid disconnecting switch with connection bars is located on the right side of the "ACBOX"(Figure 5-11).

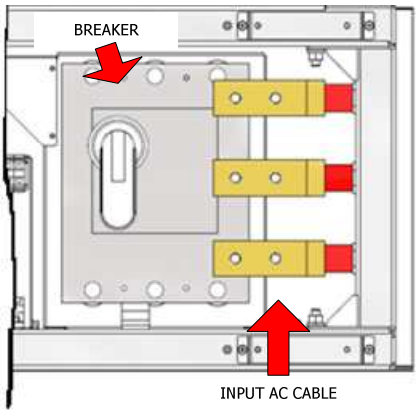


Figure 5-11: AC Cables Input (versions with power ≥275kW or without Transformer)

In the central part (Figure 5-12) is located: the auxiliary AC power input and the relative switch, an electrical socket, a protection module against overvoltages for the serial line, the terminal block with the connections for the serial communication and other signals.

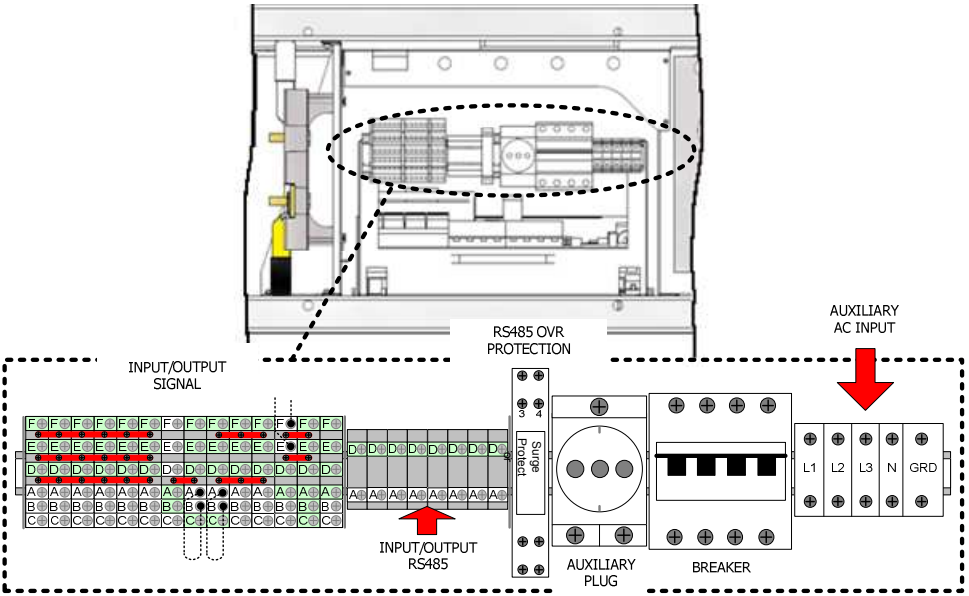


Figure 5-12: Signal Input/Output (versions with power ≥275kW or without Transformer)

In the base of the removable box there are the control/protection devices:

- AC grid breaker.
- Twilight switch.
- GROUND-FAULT control device.
- Thermostat
- Others.

The front panel has a removable and washable filter.

Chapter §16.1.1.2

5.2.2 DC Box (B)

On the external front panel are fixed the handles of the DC switches. The panel is removable and allows access to the fuse box and DC overvoltage dischargers.

5.2.3 55kWp Modules area (C)

This is the core of the PVI-XXX.0(-TL). Here, there are two[1] DC/AC conversion modules connected, capable of converting the photovoltaic energy into electrical energy compatible with the distribution grid.
Each module has several signal LEDs and an interactive display. The modules can be extracted by first removing the interlocking front panel. This latter is provided with a removable and washable filter.

5.2.4 AC Fuses area (D)

Removing this panel you can access the fuses on the AC line of each module. In addition, two transparent windows allow to inspect if one or more fuses are faulty.

Chapter §16.1.4.2

5.2.5 Framework (E)

This group, called Framework, contains the B, C and D areas and it may be complete (100kW version), or certain electro-mechanical elements corresponding to the superior module may be missing in the upper part (50kW version).

5.2.6 Enumeration of the 55kWp Modules

The enumeration of modules is similar to the one indicated in Figure 5-1. The lower module will always have the number 1, while the final number depends on the AURORA PVI-XXX.0(-TL) model (e.g. for the model from 275kW the enumeration ranges from 1 to 5).

NOTICE

The enumeration of modules must not be confused with the serial number of the single module. The use of enumeration of single modules facilitates the connections on the DC side (where there are labels with the corresponding enumeration).

Chapter §5.1

[1] If there is a PVI-55.0(-TL) version, there is only one module present.

6. DESCRIPTION OF THE INPUT CONFIGURATIONS AND DC SWITCHES OPERATION

6.1. Possible field configurations

There are various ways of configuring the AURORA PVI-XXX.0(-TL) input in order to meet the construction requirements of the photovoltaic field.

Chapter §4.1

The type of configuration is done directly in the factory (before shipping), based on the customer's indication/request, referring to the overall configuration of the system.
The need to vary the pre-set configuration must be discussed and assessed with the manufacturer.

The position of the “Master” and “Slave” inside of a Framework is not default. The module with the highest serial number is always the master.

Each Framework (indicated in the Figures below) is independent of the others, therefore, the operation of the framework will be explained later in detail.

6.1.1 Multi-Master

In this configuration the inverter behaves as many separate inverters with 55kW power, as many as the modules in the "Tower" (e.g. in a 220kW there are four). Each Module works with a MPPT system independent of the others.

Chapter §4.1.1

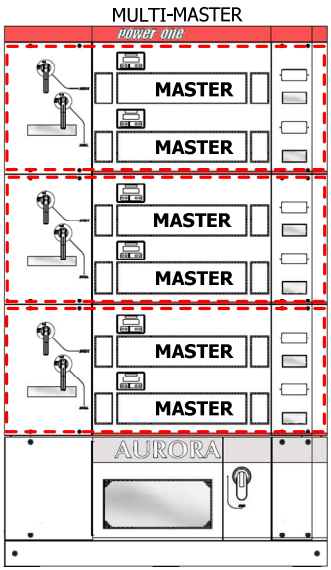


Figure 66-1: PVI-330.0-TL Composition (Multi-Master)

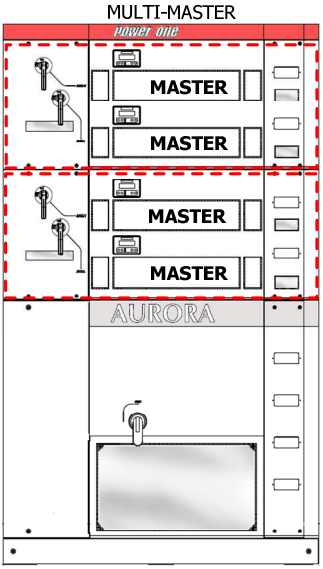


Figure 6-2: PVI-220.0 Composition (Multi-Master)

6.1.2 Multi-Master-Slave

In this configuration the inverter behaves as many separate inverters with 110kW power, half of the number of modules present in the "Tower" (e.g. in a 220kW there are two). Therefore, each Framework works separately with a MPPT system independent from the others.

Chapter §4.1.2

This configuration is feasible only for PVI-XXX.0 (-TL) with equal powers (220kW, 330kW). The 110kW version is Single-Master-Slave.

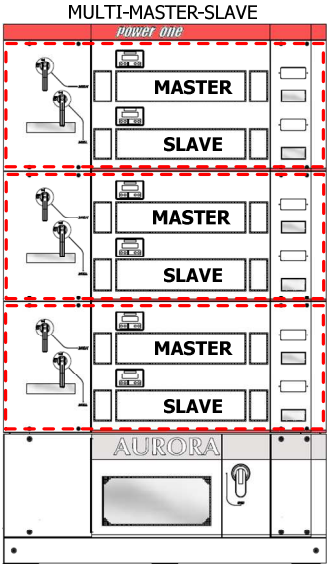


Figure 6-3: PVI-330.0(-TL) Composition (Multi-Master-Slave)

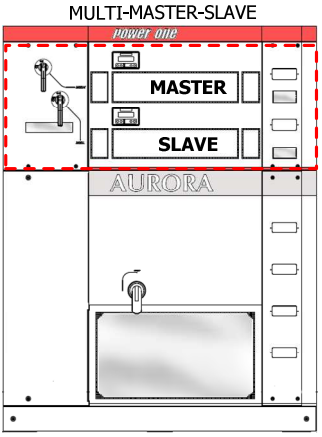


Figure 6-4: PVI-110.0 Composition (Master-Slave)

The position of the “Master” in the Framework is not default. The module with the highest serial number is always the master.

6.1.3 Master-Slave with a single Master

It is also possible to use the inverter, with sizes equal to 165kW or higher, in Master-Slave version with only one Master.

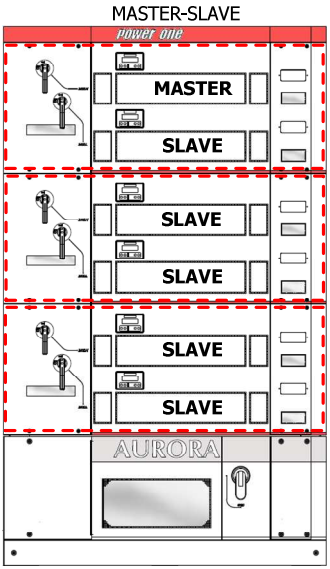


Figure 6-5: PVI-330.0(-TL) Composition (1 Master-N.Slave)

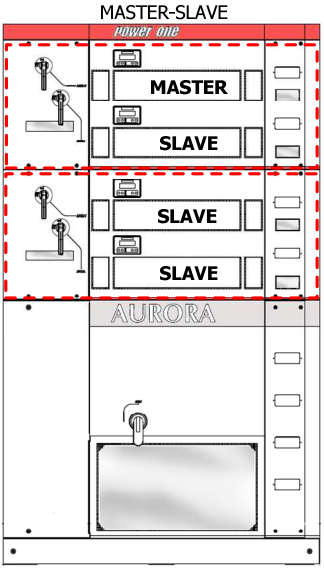


Figure 6-6: PVI-220.0 Composition (1 Master-N.Slave)

In this case, ensure that the following requirements are complied with:

- The manufacturer of the photovoltaic plant must introduce a DC switch upstream the inverter to disconnect the whole photovoltaic field.
- Pay particular attention to the manoeuvres of the DC switches.

Chapter §6.1.3.1

The position of the master in the "TOWER" is not default. The module with the highest serial number is always the master.

6.1.3.1 Features of the external DC switch

It is important to choose the external DC switch with the following features:

- Ground insulation 1000Vdc.
- Rated voltage 1000Vdc.
- Rated current: 125A x number of Modules (example PVI-330.0: 125x6 = 750Adc).
- Check serial connection mode of switch poles to ensure 1000Vdc cut-out.
- It is recommended the sole function of the switch. Given the limited nature of the field current it is preferable not to use breakers with solenoid switches.
- If breakers with solenoid switches are being used, increase the rated current with at least 25% (e.g. 330kW: use a solenoid switch not below 940A). In particular, check that at the 70 ° C ambient temperature, the thermal threshold does not react.

6.2. Function of the DC disconnecting switches in every Framework

Inside the side panel, the switch on the lower right side acts on the connection of the low module (L-Low), while the switch on the top right acts on the high module (H-High).

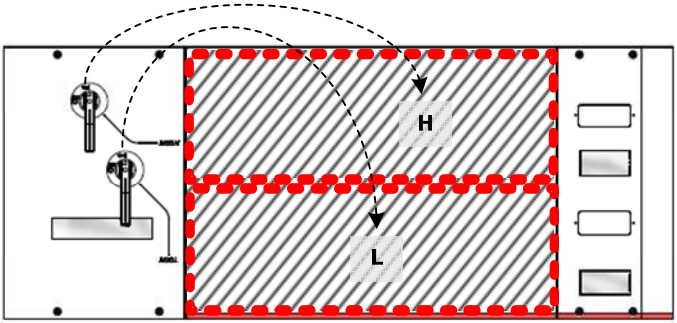


Figure 6-7: Framework - detailed action on DC switches

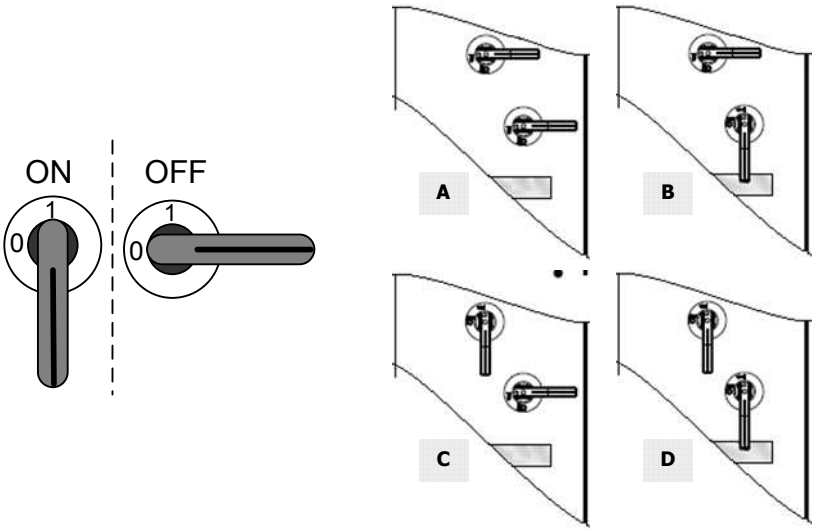


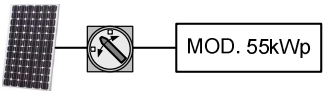
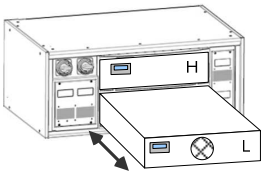
Figure 6-8: Possible switch positions

Every Framework can contain up to a maximum of 2 55kWp modules.
In a 55kWp Framework, only the lowest module (L-Low) will be installed.

6.2.1 Multi-Master System

In this configuration there is no physical link between the photovoltaic fields in each module. Each DC disconnecting switch is practically independent of the others.
The following table indicates, in the first column, the position of the switches, in the second whether the photovoltaic field is connected to the module, and in the third whether it can be removed or inserted in the seat.

Table 6-1: ADMITTED OPERATIONS AND POSITION OF THE DC SWITCHES

MULTI - MASTER				
POSITION OF DISCONNECTING SWITCHES DC (Figure 6-8**)**	**PHYSICAL CONNECTION BETWEEN DC SOURCE AND MODULE** 		**WITHDRAWAL / INSERTION OF MODULES*** 	
	H (high)	**L** (low)	**H** (high)	**L** (low)
A	NO	NO	YES*	YES*
B	NO	YES	YES*	NO
C	YES	NO	NO	YES*
D	YES	YES	NO	NO

*before withdrawal wait 5 minutes after the disconnecting switch was set to 0 (OFF)

6.2.2 Multi-Master-Slave System

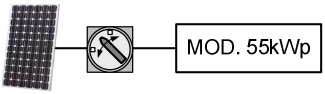
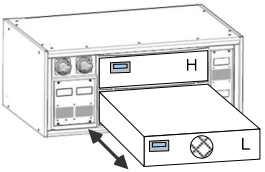
In this configuration, the two modules of the Master-Slave Framework have the same photovoltaic field. Each DC disconnecting switch is linked to the other of the same Framework.

NOTICE

In this case, it is particularly important to understand the use of the DC disconnecting switches. Improper use may cause the inverter to breakdown.

The following table indicates, in the first column, the position of the switches, in the second whether the photovoltaic field is connected to the module, and in the third whether it can be removed or inserted in the seat.

Table 6-2: ADMITTED OPERATIONS AND POSITION OF THE DC SWITCHES

MASTER - SLAVE				
POSITION DISCONNECTING SWITCHES DC Figure 6-8	PHYSICAL CONNECTION BETWEEN DC SOURCE AND MODULE 		WITHDRAWAL / INSERTION OF MODULES* 	
	H (high)	**L** (low)	**H** (high)	**L** (low)
A	NO	NO	YES*	YES*
B	YES	YES	NO	NO
C	YES	YES	NO	NO
D	YES	YES	NO	NO

*before withdrawal, wait 5 minutes after the last disconnecting switch was positioned on 0 (OFF).

6.2.3 Master-N.Slave System 1 (with inverter ≥ 165kW)

In this configuration, all modules have the same photovoltaic field. Each DC disconnecting switch is linked to the others and to the other Frameworks.

NOTICE

In this case, it is particularly important to understand the use of the DC disconnecting switches. Improper use may cause the inverter to breakdown.

The following table indicates the allowed operations for the DC switches of each framework, according to the position of the external DC switch.

Table 6-3: ADMITTED OPERATIONS AND POSITION OF THE DC SWITCHES

1 MASTER – N. SLAVE (Inverter ≥ 165kW)		
POSITION DISCONNECTING SWITCH EXTERNAL DC	**POSSIBLE ACTIONS ON DC SWITCHES**	**PROHIBITED ACTIONS ON DC SWITCHES**
OPEN (OFF)*	**After 5 minutes of the opening of the external switch, the switches can be operated without problems***	**-**
CLOSED	**DC disconnecting switches can be opened after having turned off the relative module via remote OFF, or after having disconnected the AC grid.**	**Open switches cannot be closed (in this case it is absolutely necessary to first open the external disconnecting switch and wait 5 minutes)**

- before extraction, wait 5 minutes after the external disconnector has been switched OFF (0).

7. PROTECTIONS

7.1. Protection against mains breakdown

In case of an interruption of the local distribution grid from the electricity company or if the apparatus is switched off for maintenance, AURORA must be physically disconnected in safe conditions in order to guarantee the protection of the persons operating on the grid, all in compliance with the relative applicable national standards and laws.

To avoid possible island operations, AURORA is provided with an automatic protective disconnection system.

Chapter §19
Chapter §20

7.2. Grid interface protection device (SPI)

Each PVI-XXX.0 in the ≤220kW versions with insulation Transformer and with the possibility of automatic disconnection (Contactor) is provided with a "**SPI**" protection device in compliance with the regulations of the country where the product is marketed.

For example, for the products destined to the Italian market, the following devices will be used:

- Gavazzi (p/n DPC02DM48B03)
- ABB (p/n CM-UFS.2)

Approved according to the Enel Ed.1.1/09, BDEW, RD1663/2000 guide for grid connections.

Chapter §21

7.3. Additional protection

AURORA is equipped with additional protections to guarantee the safe operation under any circumstances. Such protections include:

- Constant monitoring of the mains voltage to guarantee that the voltage and frequency values remain within operating limits (according to standards in force in the country where it is marketed).
- Internal temperature control to automatically limit power if necessary and to guarantee that the unit does not overheat.

AURORA's many control and protection devices, listed below, result in a redundant structure to guarantee operation in absolute safety.

Automatic measures:

- The DC voltage of the photovoltaic field is measured and the independent overvoltage (OV) is signalled on each module.
- The independent AC voltage on each module is measured.
- The independent AC current of each module is measured.
- The independent grid voltage frequency is measured on each module.
- Independent thermal measures on each module.
- The input insulation Resistance is measured by the Master modules.

Protection fuses:

- DC side: presence or not of the fuses, according to the input configuration for each Framework.
- AC side: 3 fuses for each module, for a total of 6 fuses per Framework.

Other protective measures:

- Magnetothermic switch at the input of the auxiliary supply network.
- Magnetothermic switch at the input of the distribution grid (300 Vac).
- DC side: protections against overvoltages (OVR), with replaceable cartridges.
- AC side: protections against overvoltages (OVR), with replaceable cartridges on the 300Vac grid and the auxiliary voltage.
- Protection against overvoltages (OVR), with replaceable cartridges on the RS485 serial line.
- Protections against overheating on each module.

8. RS485 SERIAL LINE

8.1. Connection modalities of the RS485 line

The connection for communication with the exterior of the PVI-XXX.0(-TL) occurs by means of the RS485 data serial line. Up to 32 inverters can be connected to the same line.

The line termination (120 ohm) is already foreseen inside each inverter.

NOTICE

The last PVI-XXX.0(-TL) of the chain must have the line termination enabled (Figure 8-1, Figure 8-2, Figure 8-3 and Figure 8-4), while the others must have it disabled.

Chapter §11.7.2

The use of a computer is not fundamental for the operation of the system. This is necessary only for functional verification during installation and system monitoring from a PC.

Chapter §15

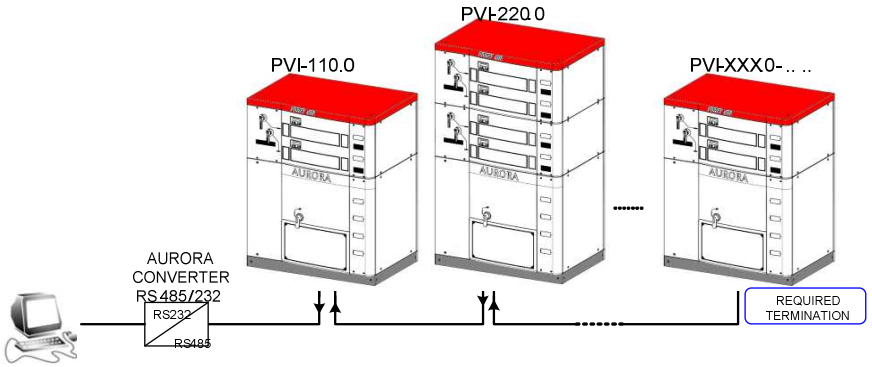


Figure 8-1: Passage mode of the PVI-XXX.0 serial cable

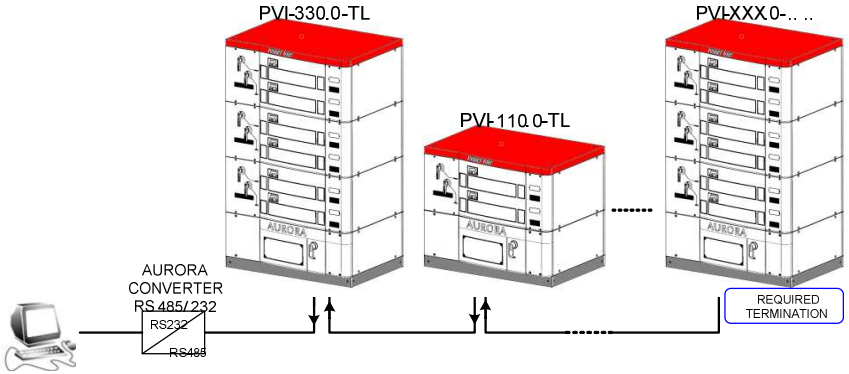


Figure 8-2: Passage mode of the PVI-XXX.0-TL serial cable

PVI-XXX.0(-TL) of various types may be connected in “daisy-chain”. It is possible to connect devices of different types and sizes.

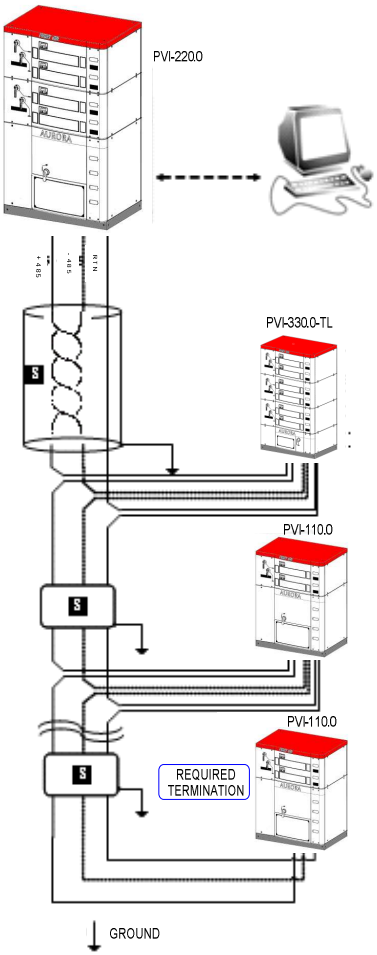


Figure 8-3: Type of connection of the PVI-XXX.0(-TL)

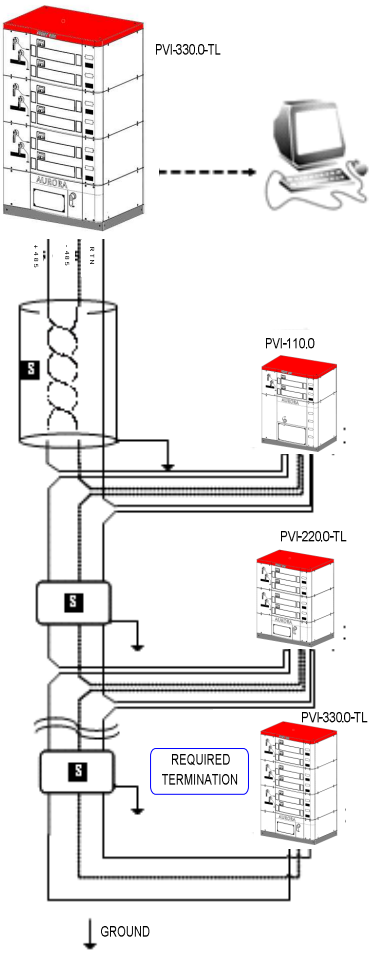


Figure 8-4: Type of connection of the PVI-XXX.0(-TL)

8.2. Connection modes for monitoring

There are 2 main modes (A and B) to connect the RS485 line from the PVI-XXX.0(-TL), in order to carry out the monitoring of the inverter, while a third mode (C) does not require the RS485 connection. Figure 8-5 shows the modes:

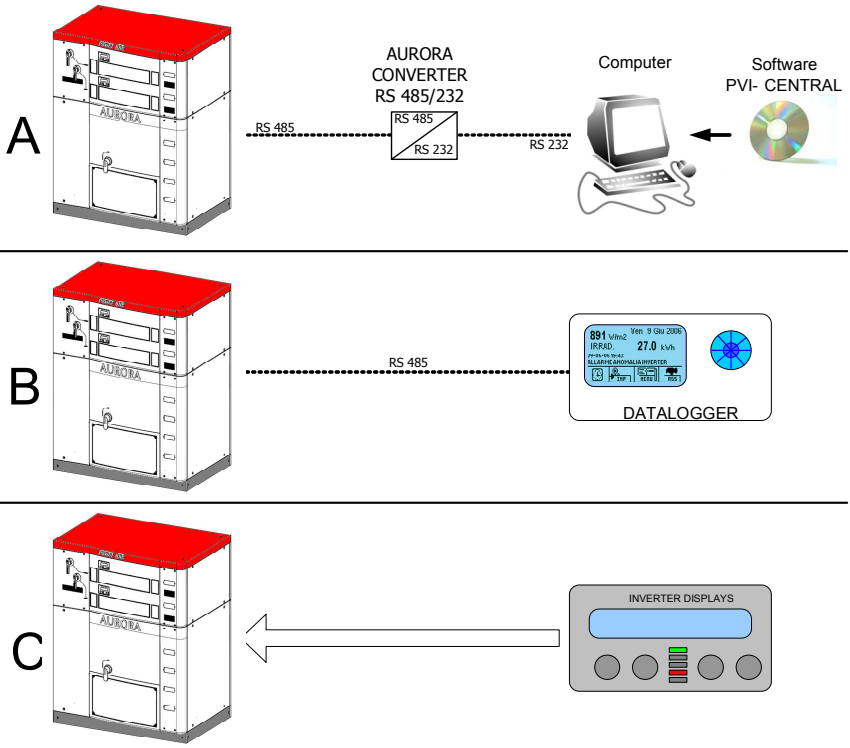


Figure 8-5: Connection modes

Where:

A) Connection to the PVI-XXX.0(-TL) with a PC.
The Computer is connected to the RS485 of the inverter by means of the Aurora RS232/485 Converter adapter. The PC must have the monitoring software installed for the PVI-XXX.0(-TL). This is the configuration used during installation and monitoring via PC.

Chapter §14
Chapter §15

B) Connection for remote control.
The WEBLOGGER remote monitoring system is connected directly to the RS485. For the operation of this system, see the WEBLOGGER user manual.

C) Stand-Alone Connection.
The monitoring of the PVI-XXX.0(-TL) occurs only through the display of the "55kw MODULES".

Chapter §13

9. STORAGE AND HANDLING

9.1. Preliminary checks

The dealer has safely delivered your AURORA to the forwarding agent, and in perfect condition. The forwarding agent, by accepting the package, assumes responsibility until delivery. In spite of the care taken by the forwarding agent, the packaging and its contents may be damaged during transport. Handling and storage of the device before installation require particular care. It is therefore necessary to follow the indications below.

NOTICE

Transport and storage temperatures must be observed.

Chapter §21

NOTICE

Since there are electronic circuits inside the cabinet and electrical connectors, particular care must be taken to avoid falls or blows which could later endanger the correct functioning of the inverter and compromise the safety of persons during installation and/or operation.

NOTICE

It is important, before installation, to check that the device is intact. Any anomalies in packaging and/or the presence of freely moving objects which do not regard the accessories provided must be taken as an alarm bell. In such cases, contact the dealer.

In conclusion, the customer is invited to carry out the following checks:

- Examine the shipping container for signs of visible damage: holes, cracks and any other sign of possible damage inside.
- Describe in writing any damage or lack of documents received; this must be undersigned by the carrier, with his full name.
- Open the shipping container and examine the contents for signs of any damage inside. When unpacking be careful not to discard equipment, components or manuals. If any damage is found, contact the forwarding agent to determine the best measures to take. An inspection may be required;
  Keep al the packaging material for the inspector!

- If the inspection reveals damages, call the dealer or the authorised dealer. He will decide whether the equipment should be returned for repair and provide instructions in this regard.
- It is the customer's responsibility to make a complaint with the forwarding agent. Failure to follow this procedure can lead to the loss of assistance under guarantee for any damages found.

9.2. Handling and withdrawal of the PVI-XXX.0(-TL) from the packaging

The package with which is delivered every PVI-XXX.0(-TL) is usually a wooden crate.

NOTICE

The handling of the inverter in the cage must be done following the instructions in this manual.

Chapter §9.2.3

9.2.1 Content of the packaging

Each package contains the following materials[1]:

Material	Qty
PVI-XXX.0	1
Mechanical Parts	2
This Manual	1
Final Test Documents	1
CD (Software)	1

[1] There may be differences pursuant to agreements with the customer.

For the 275kW and 330kW versions required with an insulation Transformer, there is a second pallet containing the Transformer and the relative wiring.

On customer's demand, there can be an additional pallet containing the extractor fan.

9.2.2 Removal of the inverter from the wooden crate

NOTICE

The packaging of the PVI-XXX.0(-TL) is done as in Figure 9-1. To withdraw the inverter it is necessary to remove the lid first, and then the side panel corresponding to the rear side of the inverter, which can be identified by the wording "**fork up from this side**".

Here are some examples of packaging:

Figure 9-1: Transport crate

Figure 9-2: Do not fork up from the front side if not really necessary

Considering the particular type of the front side of the PVI-XXX.0(-TL), you should not use this side for regular handling operations, but get from the rear side.

NOTICE

The front side, marked by the wording "**do not fork up from this side**" does not need to be removed and, as mentioned above, it should be used only if necessary, in order to avoid damaging the front part of the device (Figure 9-2).

After removing the rear part of the packaging, the wooden base must be removed in order to withdraw the PVI-XXX.0(-TL) (Figure 9-3).

Remove the wooden base to allow entry of the prongs of the forklift truck.

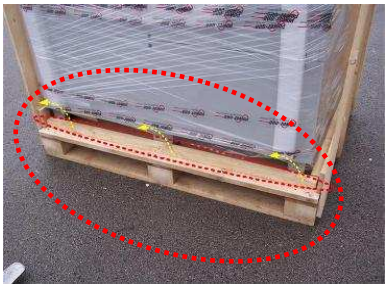


Figure 9-3: Wooden base

The mechanical parts that will complete the base are packaged separately and placed on the top of the inverter (Figure 9-4). These should be mounted after the device and connection cables were placed in permanently.

Figure 9-4: Closure mechanisms of the front and rear base

9.2.3 Handling of the PVI-XXX.0 (-TL)

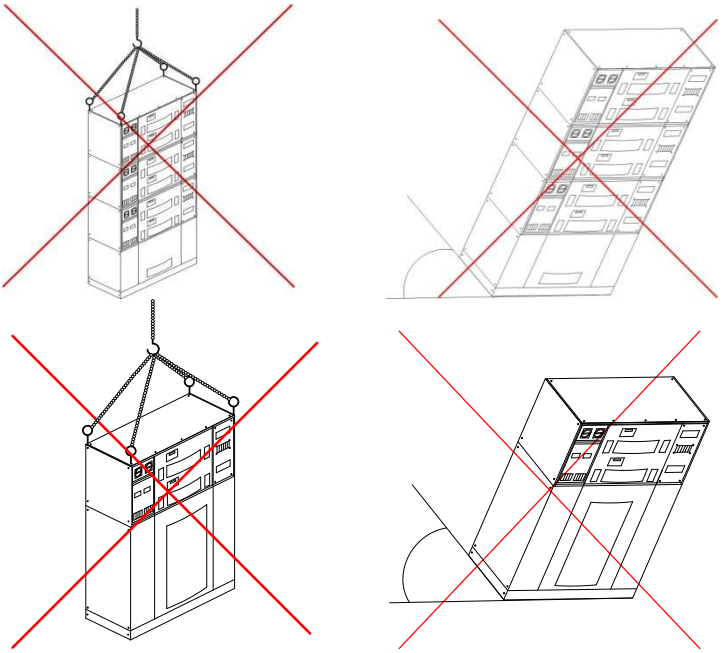
After opening the crate, the inverter may be withdrawn.

NOTICE

The withdrawal operation from the packaging and positioning of the device must be performed using specific equipment and methods described in Figure 9-6.
The following images of Figure 9-5, describe instead what must be done to avoid causing damage to the equipment.
It must be kept in mind that the weight of the inverter is not evenly distributed and therefore particular care must be taken when it is lifted.

NOTICE

The inverter may be moved by forklift truck. Since much of the weight is distributed in the upper part, it is absolutely essential to pay maximum attention when moving.
It is important to fork up the inverter in a way which guarantees the widest supporting base possible and which does not facilitate the risk of tipping up.



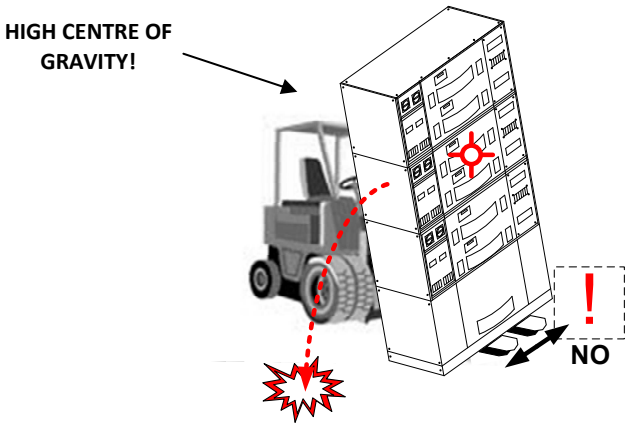


Figure 9-5: Not allowed handling

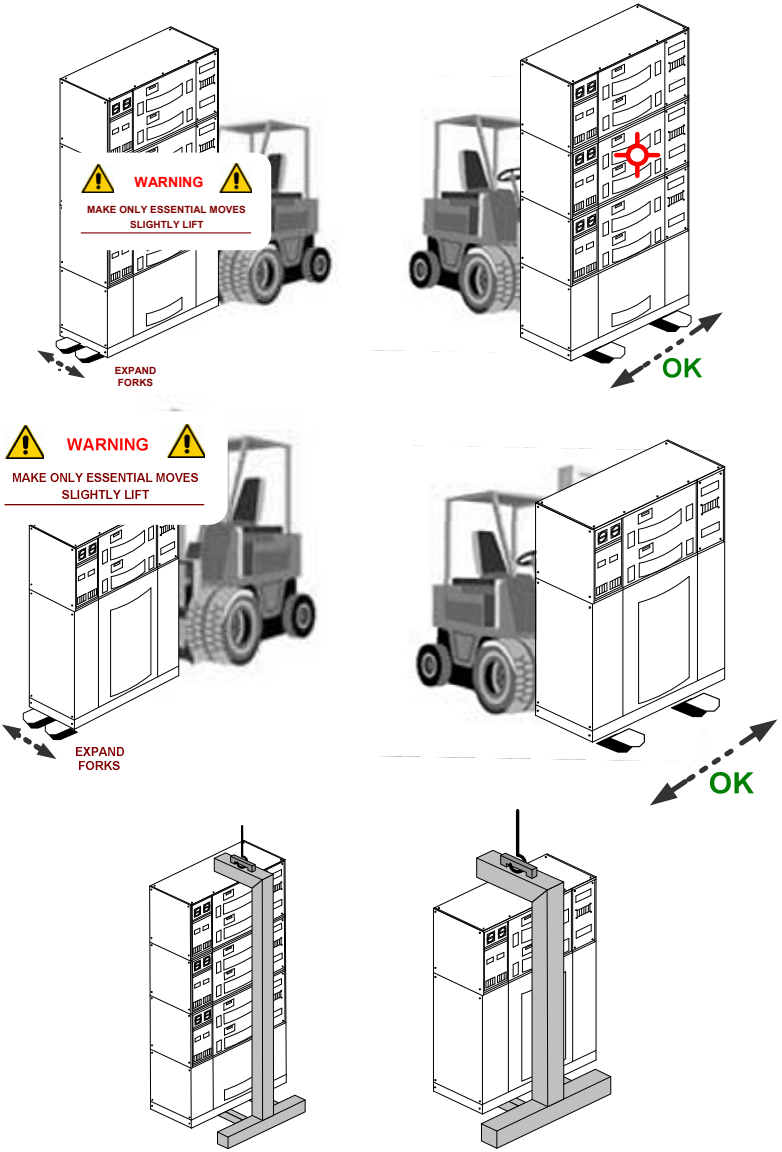


Figure 9-6: Allowed handling

10. INSTALLATION

DANGER

The electrical installation of the PVI-XXX.0(-TL) must be carried out in compliance with the applicable local and national laws. All cables used and connected to the device or under field voltage, must comply with the minimum insulation requirements of 1000Vdc. In case the low voltage cables are carried together with the wires from the photovoltaic field, the installer must ensure that the main electrical insulation conditions are guaranteed.

10.1. Installation location

The environmental situation and the position may affect the functioning of the PVI-XXX.0(-TL). The following warnings and indications on choice are being provided with regard to the position of the device:

WARNING

Do not place the PVI-XXX.0 (-TL), near inhabited areas or in places with difficult access. Any escape routes must always be left free. The place chosen must be protected from the external elements.
The room must be suitable for the installation of electrical systems.

NOTICE

Do not install the device in a position where it is directly exposed to the rays of sun: excessive temperatures could compromise the functioning of the electronic components and also reduce inverter performance. Install the inverter in a position protected from sun.

WARNING

The place where the inverter is placed must be made of flameproof material. There must be no inflammable material in the vicinity; in any case, the installation of a smoke detector device is advisable.

NOTICE

In the design phase of the plant, take into consideration the data concerning environmental and ventilation conditions. When used in humid environments it is important to have a heater or air conditioner to reduce humidity.
The quality and quantity of the air, humidity and dust can affect the good functioning of the inverter.

Chapter §21

The hardware maintenance of the is carried out mainly from the front (either the modules area or the AC BOX area (Figure 5-1 and Figure 5-2). However, it is good practice to allow access on all sides in order to facilitate any possible intervention. Special installations without side access must be discussed and agreed upon in advance with the dealer.

10.2. Positioning in the chosen place

Follow the precautions in handling, the inverter must be placed on a base which guarantees the vertical position and which can adequately support the weight.

Chapter §21

Figure 10-1 shows the dimensions of the inverter's base for all systems.
Figure 10-2 shows the cable passage holes for systems up to 220kW with insulation Transformer on board, while Figure Figure 10-3 represents the ”ACBOX” frame for all models without Transformer and for those relative to the 275kW and 330kW systems with ACbox-Transformer (Figure 10-4).

NOTICE

The inverter must be positioned vertically and not obliquely. The Tower must be absolutely stable and perfectly level.

The base on which it rests must be provided with anchorage points so that the inverter cannot be shifted accidentally.
Leave sufficient space around the inverter to allow for easy installation and removal from the positioning surface.

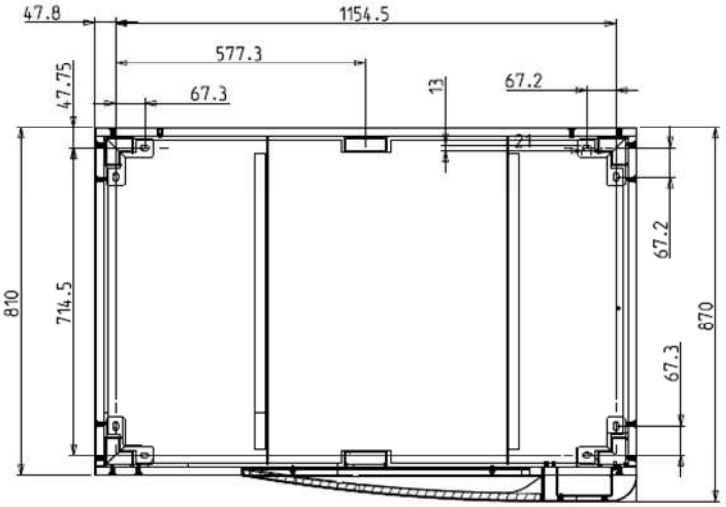


Figure 10-1: Footprint of the base (similar for all systems)

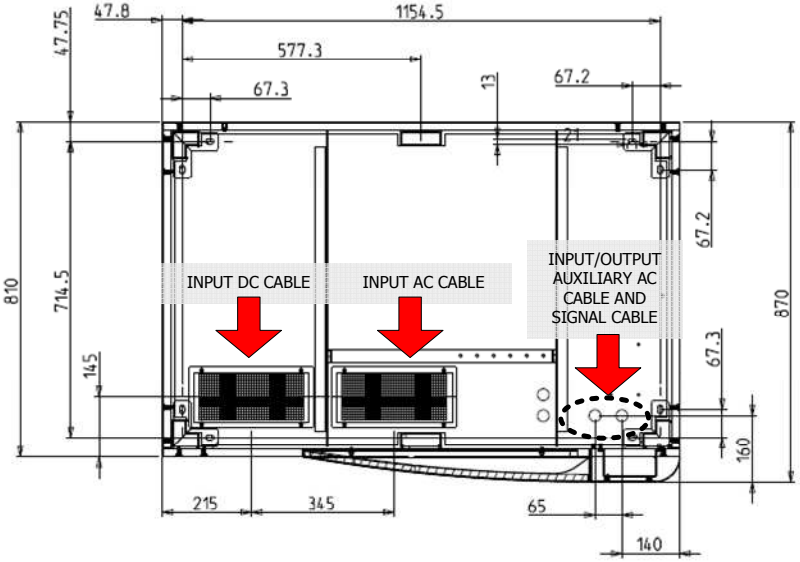


Figure 10-2: Cable passage holes for systems with Transformer ≤220kW

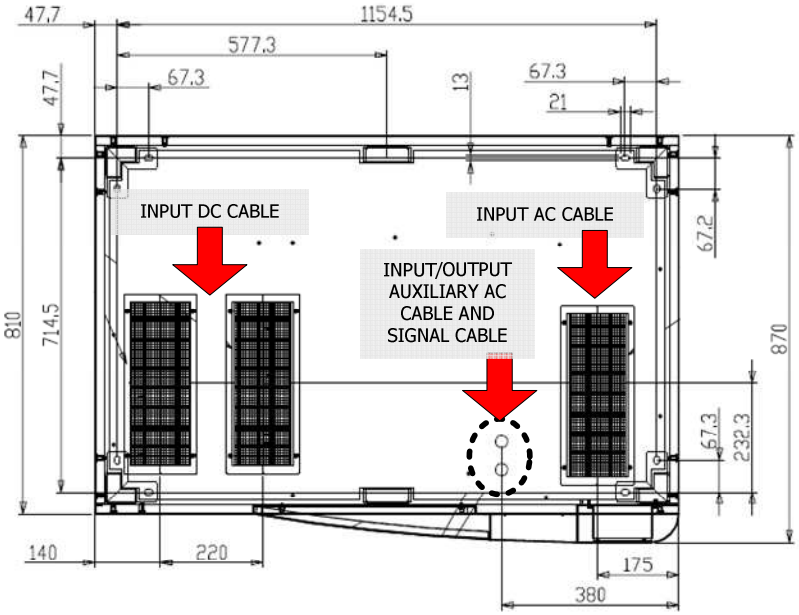


Figure 10-3: Cable passage holes for ≥275kW systems and all models without Transformer

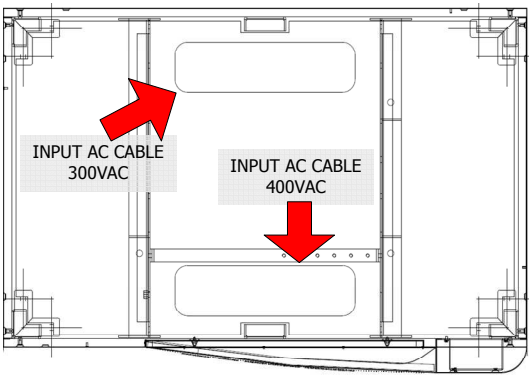


Figure 10-4: AC cable passage for ≥275Kw systems "ACbox-Transformer"

10.2.1 Air vents

Each framework has a grilled opening at the back to allow the outflow of hot air, as shown in Figure 10-5, or, for versions up to 110kW, it has a grilled fan on the top as shown in Figure 10-6. Every grill has 6 threaded anchorage points, as indicated.

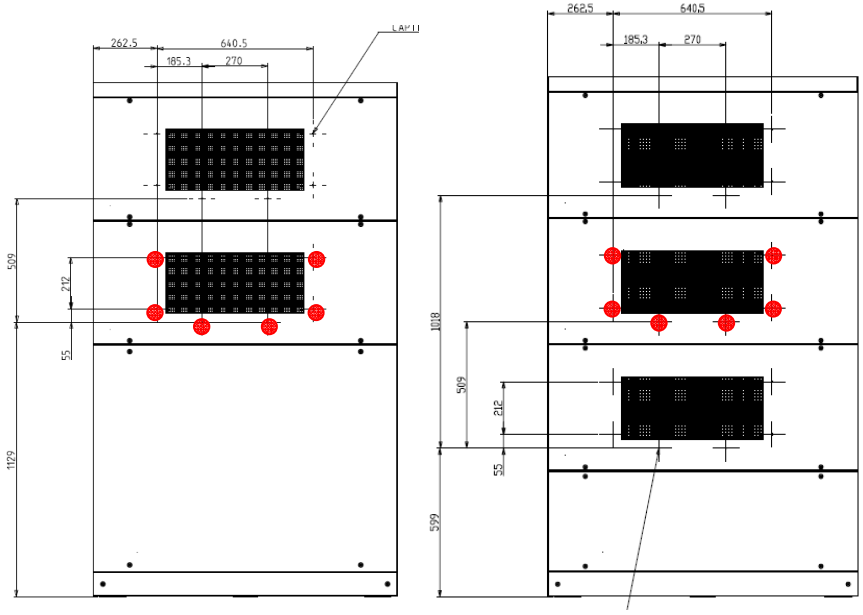


Figure 10-5: Rear ventilation grills[1]

[1] Standard for versions from 165kW.

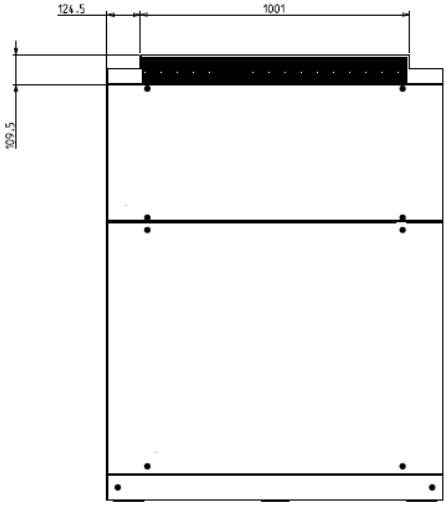


Figure 10-6: Hot air outlet fan for versions up to 110kW

10.2.2 Safety distance

The following figure shows the minimum recommended distances to be observed:

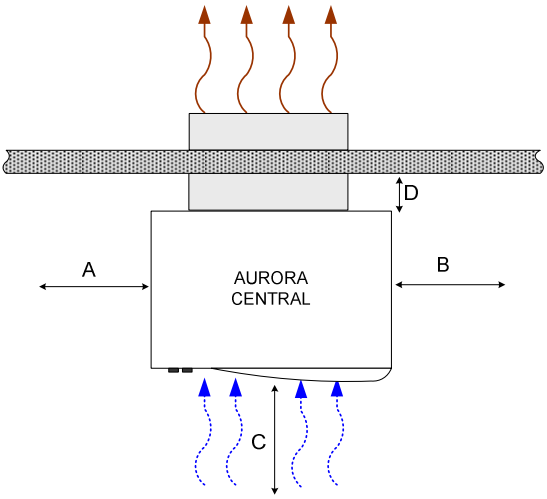


Figure 10-7: Safety distance

Table 10-1: Table of recommended distances*

A	B	C	D
400mm	300mm	800mm	165mm (with air conduct)
400mm	300mm	800mm	50mm (without air conduct)

* Recommended distance, which may be adjusted in agreement with the customer and taking into consideration the type of installation.

If necessary, it is possible to reduce the distances between A and B to fully put side by side the inverters.

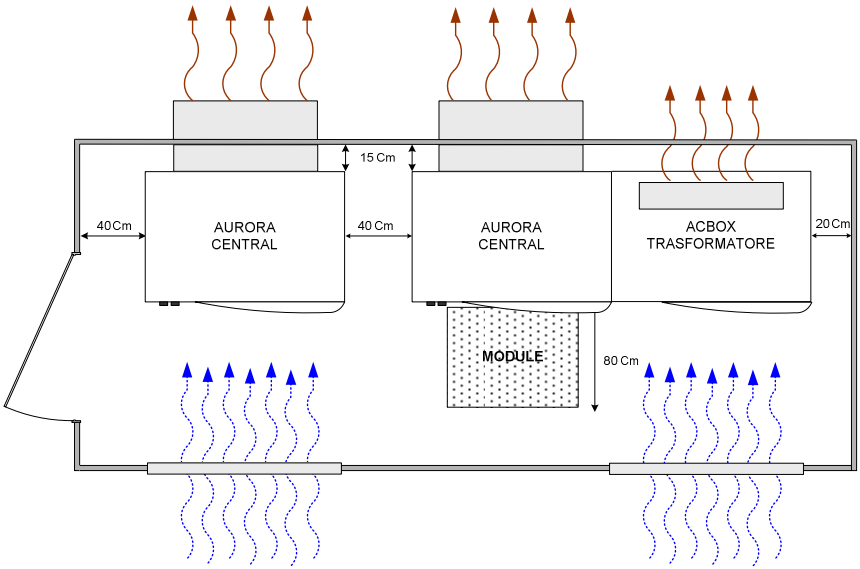


Figure 10-8: Example of installation

The example above shows a cabin with the following points:

- Air entry grill / filter
- 1 PVI-220.0
- 1 PVI-330.0
- Simulation of the withdrawal of the 55kWp module
- Hot air exit grills / ducts

As it can be seen, in this example the indications of the Table 10-1have been observed.

10.2.3 Removal of panels to make the connections

Remove the panels indicated below.
Front lower panel (Figure 5-1, Figure 5-2: A) allows to access the AC connections for the connection to the distribution grid at 400Vac[1] or 300Vac[2], to the 3P+N (400Vac) voltage connection that supplies the control logic, the internal fans and the front terminal block where the RS485 connection is present for communication.

Front panel placed on the framework (Figure 5-1, Figure 5-2: B) to the DC fuses box, DC overvoltage dischargers and to the communication configuration card.

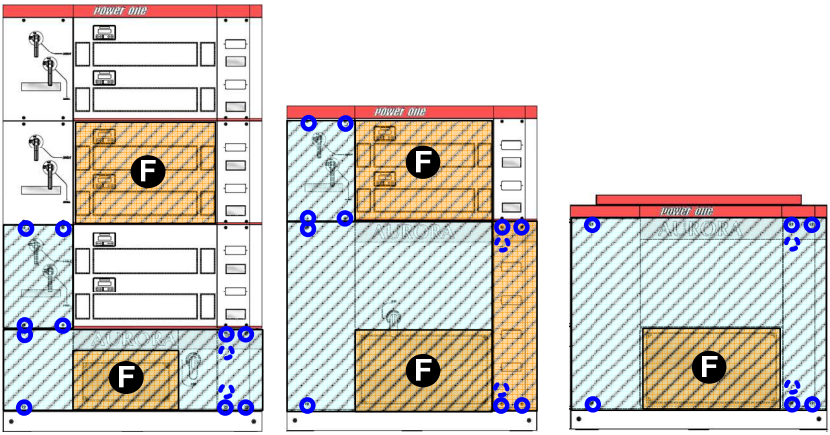


Figure 10-9: Panels to be removed

Use a screwdriver to remove the screws shown in Figure 10-9. To remove the front panel, the switch handle, if present, must be in the 0 (OFF) position.
In the Acbox-Transformer remove the front screws for the front panel and, if necessary, remove the upper hex screws to remove the top).

(F) indicates the filter area. This panel is placed at the joint and can be removed by pulling it towards you.

To remove the panels it may be necessary to disconnect the wire of the earth connection. Remember to reconnect this wire before reclosing every single panel!

[1] up to 220kW inverter and ≥275kW cabinet transformer
[2] only on towers of 275kW and 330kW

10.2.4 Composition of the ACBOX area

After removing the front panel, the following area can be identified:

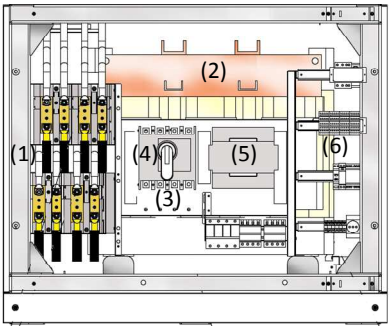


Figure 10-10: Composition of the ACBOX Area (versions with ≤220kW Transformer)

Where:

(1) DC cable connection area
(2) Insulation Transformer
(3) AC power network connection bars
(4) Magnetothermic disconnecting and safety switch
(5) Transformer connection Contactor
(6) Area for connection clamps for auxiliary AC and serial communications.

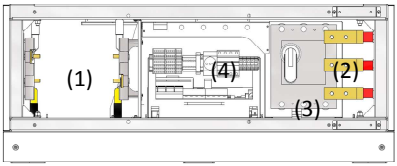


Figure 10-11: Composition of the ACBOX Area (versions with power ≥275kW or without Transformer)

Where:

(1) DC cable connection area
(2) AC power grid connection bars
(3) Magnetothermic disconnecting and safety switch
(4) Area for connection clamps for auxiliary AC and serial communications.

10.2.5 Cable passage area

Figure 10-12, Figure 10-13 and Figure 10-14 show how these cables should be positioned.

Pass the DC, AC, auxiliary AC, Earth and RS485 cables through the openings made at the base of the inverter (Figure 10-2, Figure 10-3, Figure 10-4).

These openings can easily be cut to suit the positioning of the cables.

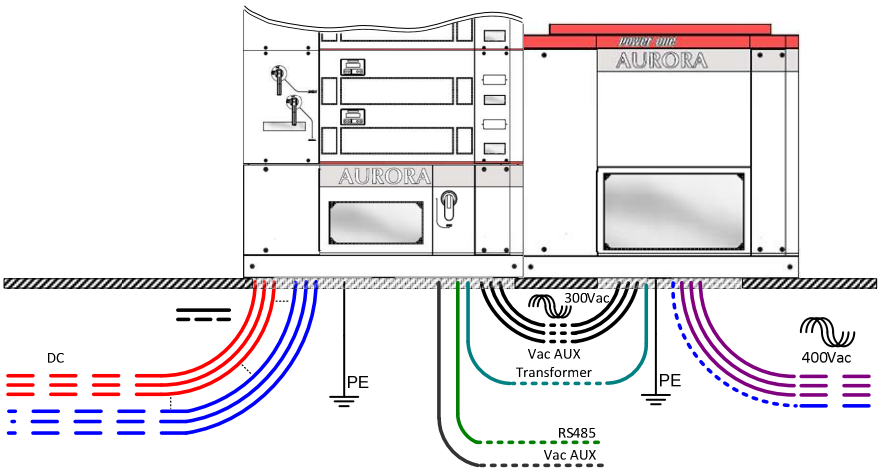


Figure 10-12: Cable output under the inverter (versions ≥275kW)

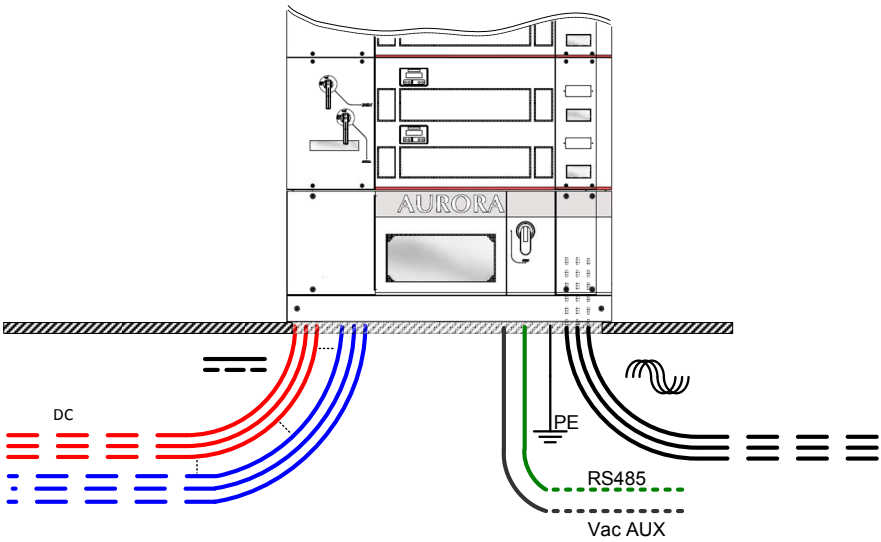


Figure 10-13: Cable output under the inverter (versions without Transformer)

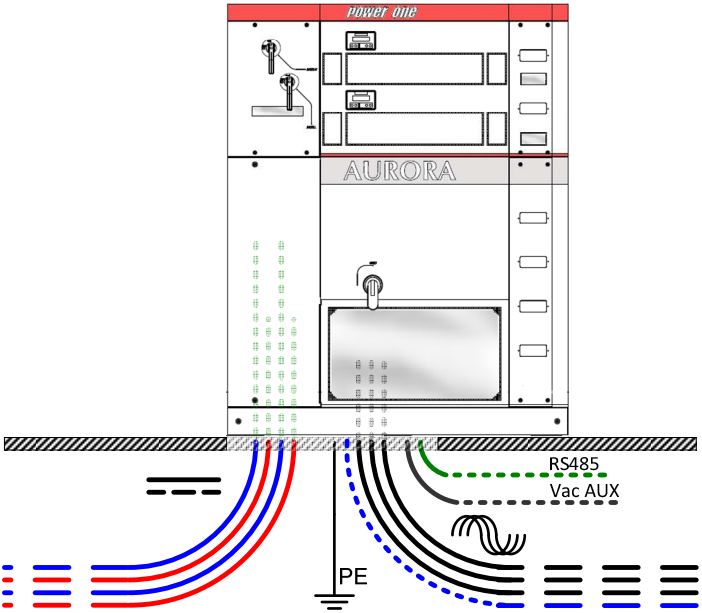


Figure 10-14: Cable output under the inverter (versions ≤200kW)

11. ELECTRICAL CONNECTION

DANGER

Before handling any cable, make sure, using suitable instruments, that there is no dangerous voltage.

WARNING

The connection of AURORA to the electrical grid must be carried out only by qualified operators and only after having received authorisation from the electricity company that administrates the mains.

11.1. Preliminary operations for the electrical connection

For details of each single operation to be carried out, the instructions given in this chapter (and in its sub-chapters) and all the safety warnings must be read carefully and followed step by step.

Any operation which does not comply with these instructions could create a situation of danger for the operator/installer and damage the appliance.

It is extremely important and opportune to disconnect the photovoltaic field before making the connection to the inverter by means of the upstream DC switches, since there could be high voltages capable of generating conditions of serious danger.

Always respect the nominal voltage and current characteristics, when designing your own system. In particular, always keep in mind the following with regard to the photovoltaic system:

- Maximum array DC voltage input to each of the MPPT circuits found under any conditions.
- Maximum array DC current input to each of the MPPT circuits found under any conditions.

Chapter §21

11.2. Connection of the DC cables from the photovoltaic field

After having carefully read and understood the premises of the preceding paragraphs, the cables from the photovoltaic field can be connected.

Chapter §6

Since the Master/Slave or Multi-Master configuration is already carried out before delivery of the inverter, only the DC cables have to be connected.

Follow the directions in the points and of the following figures:

- Locate the DC cables from the photovoltaic field.
- Connect the cables in the input terminal block (Figure 11-1 or Figure 11-2) respecting the correct polarities.

Chapter §5.2.1

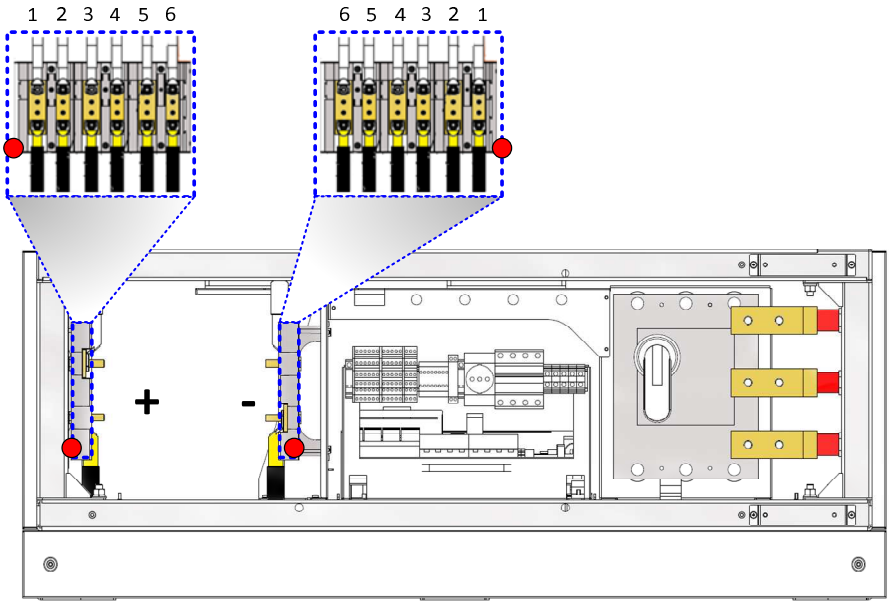


Figure 11-1: DC cable connection (versions with power ≥275kW or without Transformer)

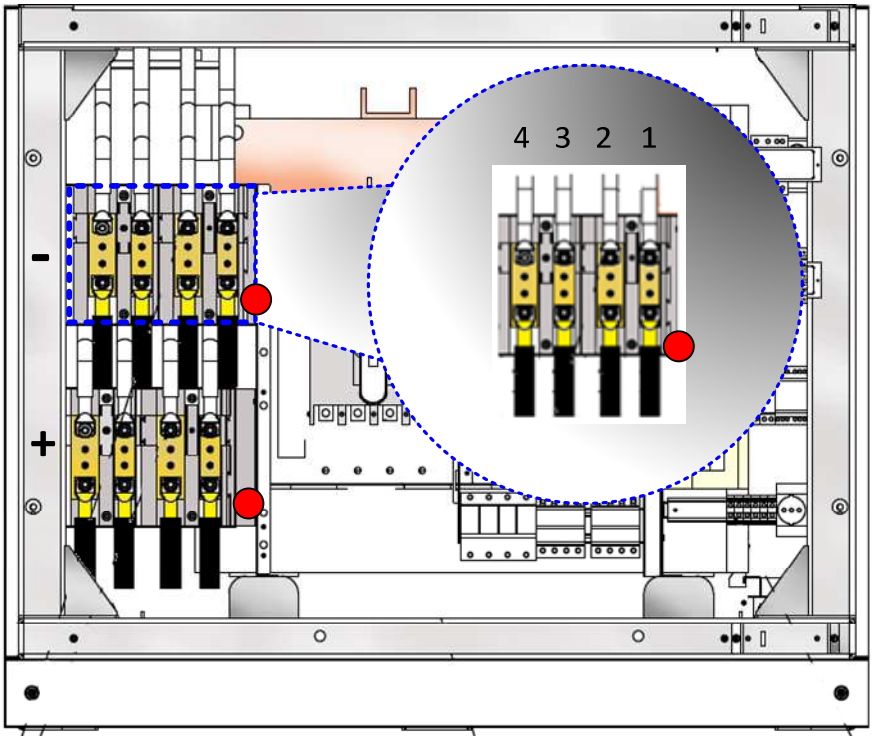


Figure 11-2: DC cable connection (versions ≤220kW with Transformer)

After the cable passage it is important to make sure that the open grill holes are closed, e.g. by means of expanded foam. This operation guarantees that no animals or dust can get inside.

11.3. Connection of the protection earth cable (PE)

⚠ WARNING

For the safety of the PV plant the grounding resistance of the plant itself, is determinant. The latter must be established before the first start up of the Plant (In Table 11-2 are reported the minimal sections recommended to be used). It is care of the installer in compliance with the IEC536-2, to allign the dimensioning of the grounding conductor alongside with the characteristics of the inverter used and of the PV plant in order to minimize the grounding resistance. Perform the connection on behalf of the grounding cable with lug (yellow/green) to the screw (Figure 11-3 e Figure 11-4).

Tabella 11-1: Tabel of the minimum recommended dimensions for the grounding cables

Model	Section	Lug
PVI-55.0(-TL)	1 x 50 mmq	M 12
PVI-110.0(-TL)	1 x 70 mmq	M 12
PVI-165.0(-TL)	1 x 95 mmq	M 12
PVI-220.0(-TL)	1 x 120 mmq	M 12
PVI-275.0(-TL)	1 x 150 mmq	M 12
PVI-330.0(-TL)	1 x 185 mmq	M 12

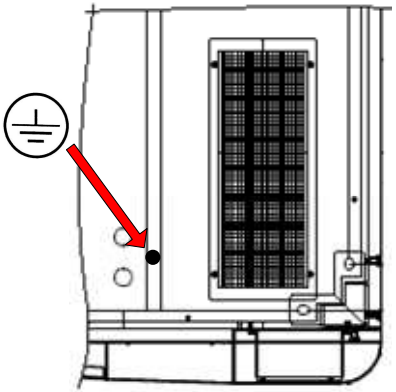


Figure 11-3: Connection of the protection Earth cable (PE) for ACBOX without Transformer

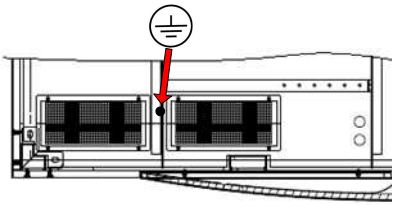


Figure 11-4: Connection of the protection Earth cable (PE) for ACBOX with Transformer

For the models 275kW and 330kW, connect the grounding cable supplied in the Acbox-Transformer, directly between the grounding copper bar of the rack and the space of the Acbox-Transformer itself.

11.4. Connection of the AC power cables

- Remove, if present, the front protection plastic cover placed in front of the bars, by means of the anchorage screws.
- Connect the AC power cables as indicated in Figure 11-5 or Figure 11-6.
- For the 275kW and 330kW versions, connect the power cables (supplied) from the 'ACbox-Transformer to the front three bars.

NOTICE

Respect the sequence of the phases indicated on the specific labels.

WARNING

It is important that the AC cables have a dielectric strength of at least 1000Vdc.

After the cable passage it is important to make sure that the open grill holes are closed, e.g. by means of expanded foam. This operation guarantees that no animals or dust can get inside.

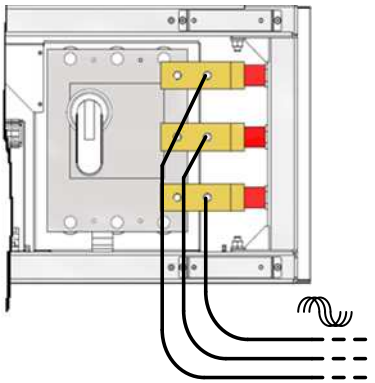


Figure 11-5: Connection of the AC power cables (versions with ≥275kW power or without Transformer)

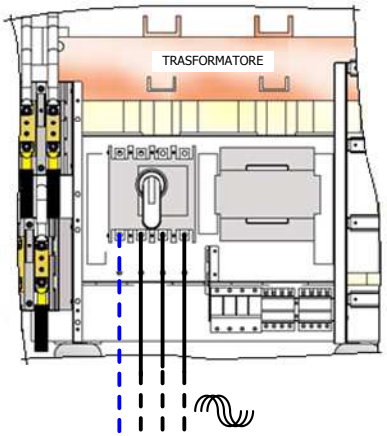


Figure 11-6: Connection of the AC power cables (versions with ≤220kW power)

11.5. Connection of auxiliary energy supply

➲ Connect the five-pole cable (3P+N+T) to the clamps indicated in Figure 11-8 and Figure 11-7.

NOTICE

Pay maximum attention to the connection of the neutral cable! Lack of the neutral connection (blue clamp) or its inversion with one of the three phases may cause the inverter to breakdown.

➲ Leave the QS2 switch in the OFF position (down).

The QS2 switch has two functions:

- disconnect the auxiliary voltage
- disconnect the system in the case of breakdown of the OVR AC devices.

This switch is always accessible.

➲ For the 275kW and 330kW versions, also connect the four-pole cable (3P + N) supplied in the compartment of the Acbox-Transformer, to the appropriate counterpart.

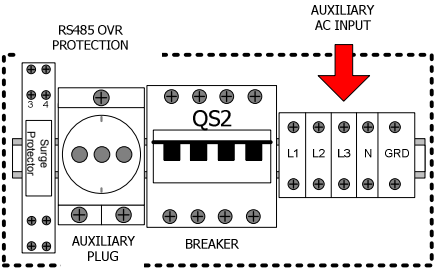


Figure 11-7: Clamps for connecting the auxiliary AC grid and the relative magnetothermic switch (versions with power ≥275kW or without Transformer)

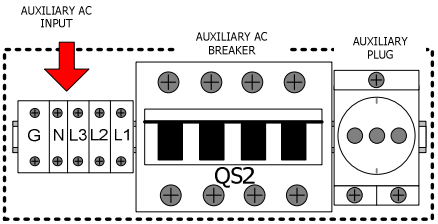


Figure 11-8: Clamps for connecting the auxiliary AC grid and the relative magnetothermic switch (versions with Transformer with power ≤220kW)

NOTICE

It is important to leave a gap of 30 cm of cable pocketed in the ACBOX to allow the full extraction of the AC drawer.

Chapter §17.7

11.6. Connection of the Twilight Sensor (only for PVI-XXX.0 ≤220kW)

Each PVI-XXX.0, equipped with twilight, comes with the light sensor to be installed (Figure 11-10).

If the sensor is not installed and configured the inverter cannot connect to the AC grid.

- Connect the light sensor to terminals 2 and 4. Place the light sensor vertically and not in a shady place throughout the day.
- Adjust the lever and the sensitivity knob, located on the twilight relay of Figure 11-9, so as to activate the relay in the desired light conditions.

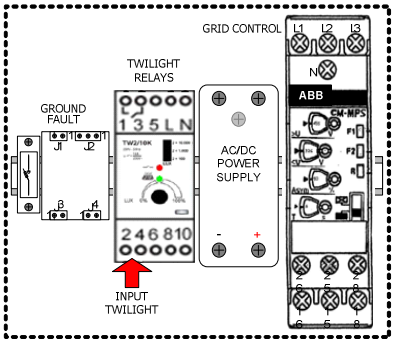


Figure 11-9: Twilight Relay (versions with ≤220Kw power Transformer)

Figure 11-10: Twilight

NOTICE

It is important to leave a gap of 30 cm of cable pocketed in the ACBOX to allow the full extraction of the AC drawer.

Chapter §17.7

11.7. Connections for communications / state signals

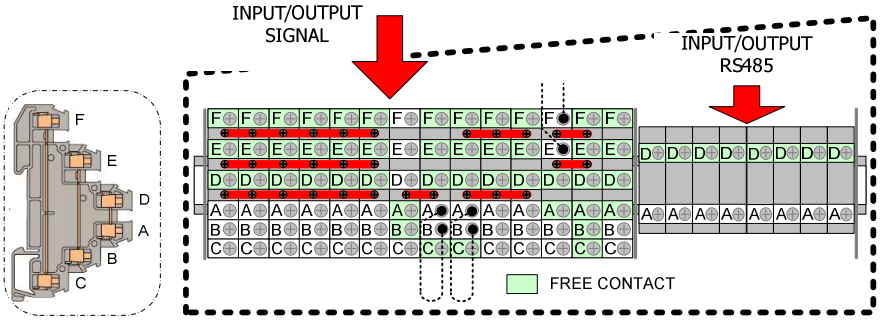


Figure 11-11: Internal terminal block ACBOX area

➲ Get a flat screwdriver of the correct size for the clamp screws (with a tip of approx. 3.5 mm). Make the following connections, loosening the screw, inserting the cable/s and then tightening the screw again (maximum torque 0.5 N/m).

Do not tighten the screws with force to a torque of more than 0.5N/m to avoid damaging the clamp.

Figure 11-11 replicates the terminal block in the ACBOX area.

Chapter §5.2
Figure 5-8
Figure 5-12

The X20 and X27 clamps are dedicated to the communication connection (Table 11-2).

Clamps from X1 to X6 are dedicated to the state of the 55kWp modules (Table 11-3).

Clamps X10 and X11 are connections for switching on / off via an external command (Table 11-4).

In Figure 11-11, on the left, is also indicated the composition of a single clamp (from X1 to X14): as it can be seen, connections C-F, B-E and A-D are through connections.

The following tables show the signals present on the terminal board:

Table 11-2: Communication signals in the terminal block

X20		X21		X22		X23	
D	GRD_5V_ISO	D	+485_USR	D	-485_USR	D	GRD
A	GRD_5V_ISO	A	+485_USR	A	-485_USR	A	GRD
X24		**X25**		**X26**		**X27**	
D	GRD7	D	+485_USR_2	D	-485_USR_2	D	GRD
A	GRD7	A	+485_USR_2	A	-485_USR_2	A	GRD

Table 11-3: State signals in the terminal block

X1		X2		X3		X4		X5		X6	
F	-	F	-	F	-	F	-	F	-	F	-
E	-	E	-	E	-	E	-	E	-	E	-
D	-	D	-	D	-	D	-	D	-	D	-
A	AUX_C1	A	AUX_C2	A	AUX_C3	A	AUX_C4	A	AUX_C5	A	AUX_C6
B	AUX_NO1	B	AUX_NO2	B	AUX_NO3	B	AUX_NO4	B	AUX_NO5	B	AUX_NO6
C	AUX_NC1	C	AUX_NC2	C	AUX_NC3	C	AUX_NC4	C	AUX_NC5	C	AUX_NC6

Table 11-4: Control signals in the terminal block

X9		X10		X11	
F	GRD 7	F	REMOTE 3	F	REMOTE 4
E	GRD 7	E	REMOTE 5	E	REMOTE 6
D	GRD 7	D	REMOTE 1	D	REMOTE 2
A	GRD 7	A	REMOTE 1	A	REMOTE 2
B	GRD 7	B	REMOTE 5	B	REMOTE 6
C	GRD 7	C	REMOTE 3	C	REMOTE 4

NOTICE

To the state clamps (Table 11-3) a low voltage signal can be connected (e.g. 12V or 24V) with an absolute maximum amperage of 1A.

11.7.1 Connection for the user RS485 serial communication

Proceed with the connection of the RS485 serial line.
See also Table Figure 11-11 and Table 11-2, for the position and names of the signals in the terminal block.

Chapter §8

The clamps from X20 to X23 and X24 to X27 are fully removable, facilitating the connection operation.

- Connect the 485+ signal/s to the X21D clamp.
- Connect the 485- signal/s to the X22D clamp.
- Connect the return/s (RTN or earth) to the X20D clamp.
- Connect the screening of the screened cable to the X23D clamp.
- After every connection try pulling the cable to make sure that it is correctly screwed.
- If PVI-XXX.0(-TL) is not the last of the chain, it is necessary to make sure that the 120 ohm termination is not present.

NOTICE

It is important to leave a gap of 30 cm of cable pocketed in the ACBOX to allow the full extraction of the AC drawer.

Capitolo §17.7

11.7.2 Setting of the 120 ohm termination of RS485

Each PVI-XXX.0(-TL) leaves the factory without the 120ohm termination of the RS485 communication line already set disabled.
Figure 11-12 and Figure 11-13 illustrates the three mechanical configurations which show the presence of a card inside every framework and the dip-switch relative to the termination.

The card is easily accessible by removing the front panel.

Chapter §10.2.3

If a daisy-chain connection is used (Figure 8-1 to Figure 8-4), it is important that all racks, except the last one, must have the termination disabled.

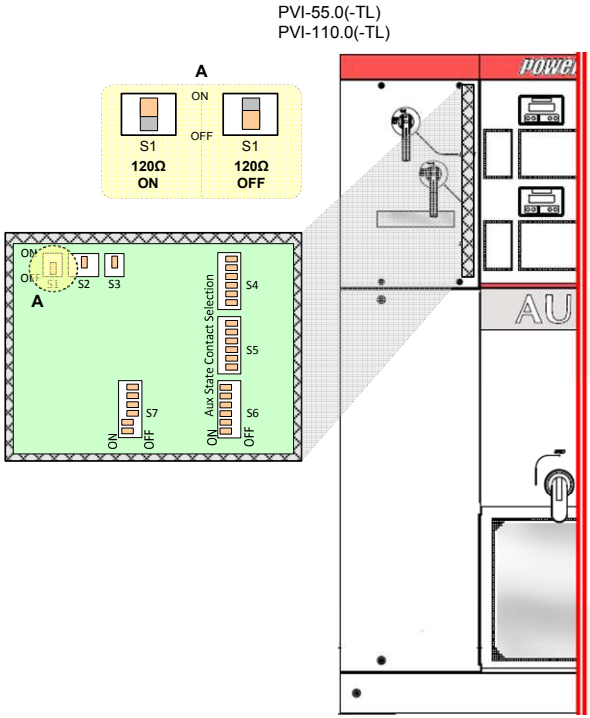


Figure 11-12: Switch position of the 120 ohm termination

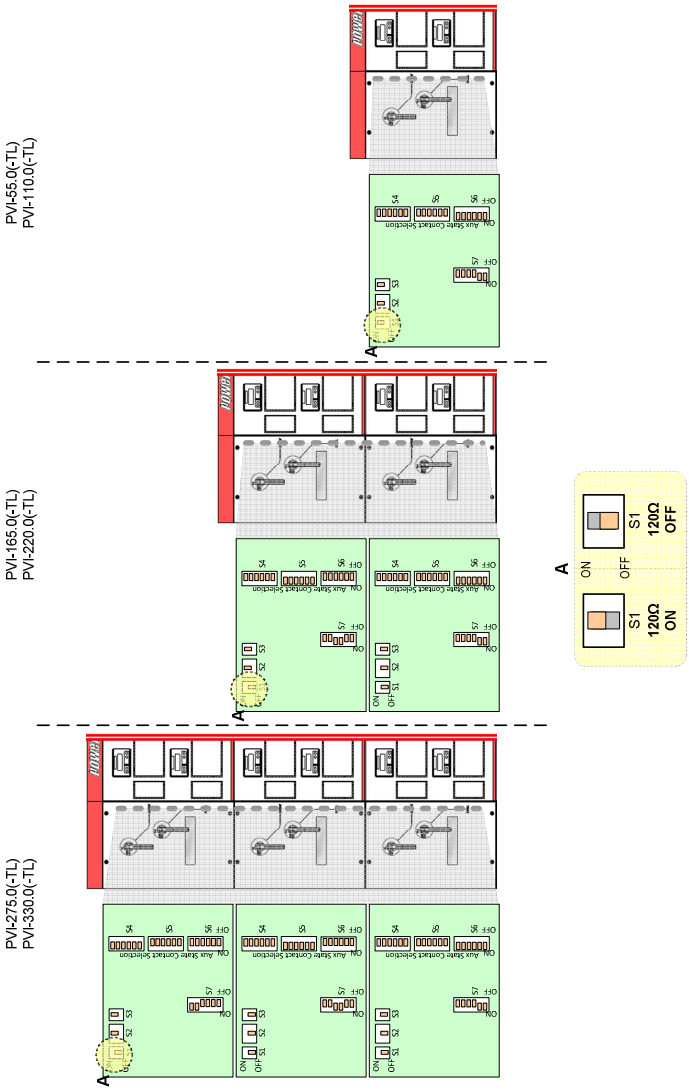


Figure 11-13: Switch position of the 120 ohm termination

11.7.3 Connection for the RS485 serial communication with PVI-STRINGCOMB(-S)

Each PVI-XXX.0(-TL) inverter can manage up to 12 boxes for the connection of the PVI-STRINGCOMB(-S) strings.
Following the indications of the PVI-STRINGCOMB(-S) manual, the connection of the RS485 serial line is then made.
See also Table Figure 11-11 and Table 11-2, for the position and names of the signals in the terminal block.

- Connect the 485_2+ signal to the X25D clamp.
- Connect the 485_2- signal to the X26D clamp.
- Connect the return (RTN or earth) to the X24D clamp.
- Connect the screening of the screened cable to the X27D clamp.
- After every connection try pulling the cable to make sure that it is correctly screwed.

11.7.4 Connection for the state signalling of the single 55kWp modules.

With reference to Table Figure 11-11 and Table 11-3, the state of the "n" box can be monitored, verifying the position of the AUX contact.

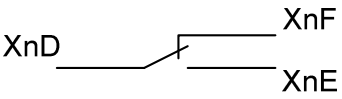


Figure 11-14: AUX contact for state signalling

This contact, in sleep mode, is connected internally, as illustrated in Figure 11-14. Where n indicates the number of the 55kWp box, according to the numeration indicated in Figure 5-1, Figure 5-2.

Chapter §5.2.6

There are two modes of operation used for this contact:

11.7.4.1 TWILIGHT Mode.

When the solar field voltage (Vpanel), as detected by a module, drops below the set threshold, the AUX contact switches from excitation condition (XnD-XnE closed) to sleep condition (XnD-XnE open) (please also see previous figure).

11.7.4.2 GRID Mode.

When a 55kWp module is disconnected from the grid, the AUX contact switches from excitation condition (XnD-XnE closed) to rest condition (XnD-XnE open) (please also see previous figure).

The contact is provided from factory with GRID mode functioning. Changing this function is only possible from the service menu (Figure 13-3) (contact the dealer for the access password and other details for the modification).

NOTICE

It is important to leave a gap of 30 cm of cable pocketed in the ACBOX to allow the full extraction of the AC drawer.

Capitolo §17.7

11.7.5 Connection for the on and off command of the single 55kWp modules.

With reference to Table Figure 11-11 and Table 11-4, it is possible to control, by pressing the REMOTE n signals, the mains connection or otherwise of the single modules.
By default, all REMOTE n signals are connected to earth (X9) via jumpers with screws on the terminal block. These must be removed if a you wish to make a manual connection, for example via a clean relay contact.

NOTICE

Do NOT connect signals under voltage to the REMOTE n clamps, otherwise the circuits of the modules will be irremediably damaged. These must be exclusively open or connected to X9 or other clean contact.

NOTICE

It is important to leave a gap of 30 cm of cable pocketed in the ACBOX to allow the full extraction of the AC drawer.

Capitolo §17.7

11.7.6 Setting of the communication addresses.

- Put the QS2 switch in ON position (up): if the auxiliary line is under voltage, all the present displays will be turned on.
- Set from the display (Figure 13-3) a different RS485 address on every module, according to the following indications:
  - If the 485 line is connected to a single tower, set a different address on every module of the tower.
  - If the 485 line is connected to more than one tower, set a different address on every module of each tower.

Chapter §13

MAKE SURE THAT THERE ARE NO SIMILAR 485 ADDRESSES IN THE SYSTEM.
THIS MAY CAUSE COMMUNICATION CONFLICTS.

11.7.7 Final checks.

- Close the front panels, taking care that the handles, if present, are positioned on 0 (OFF) and insert and tighten the screws.
- Close all the other panels, after first reconnecting the respective earth cable to the inverter casing.

12. START UP (SERVICE)

Before starting up the system, make sure that all connections have been made correctly and, in general, that all safety conditions have been complied with. In particular, make sure that all voltage values are within the set limits.

Chapter §21

12.1. Operating conditions

The following diagram gives an indicative illustration of the various functional phases of the inverter.

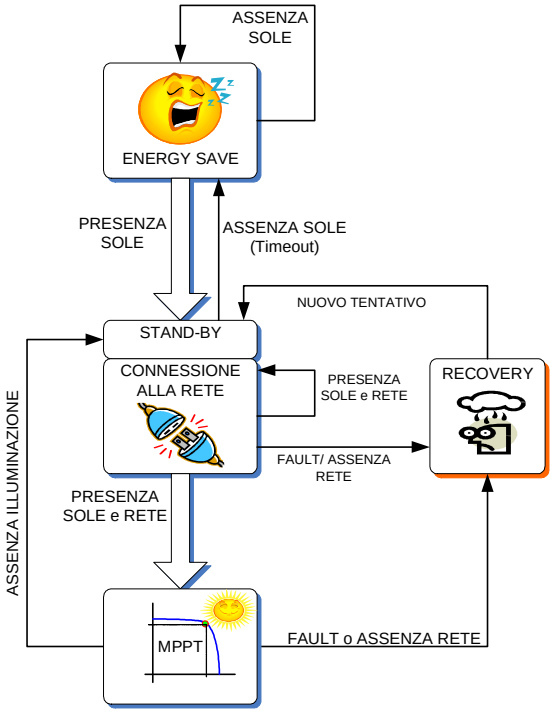


Figure 12-1: Inverter's operation diagram

12.2. Sequence for commissioning (NOT valid for 1Master/N.Slave systems)

The procedure for starting up AURORA is the following:

1. Make sure that the grid switch is on 0 (horizontal position).
2. Make sure that the DC switches are on 0 (Figure 6-8 - A).
3. Make sure that the main QS2 switch is in ON position (up): the control logic of the system is activated and the displays on the front are on.
4. Check the front signalling displays on each framework:

   Chapter §5.2.5

   a. In the case of the Master-Slave ***the MASTER LED is on*** only on the Master module. The presence of several ***MASTER LEDS on*** in a master-slave group, indicates the presence of an anomaly.
   b. In the case of Multi-Master, each module must have ***a MASTER LED on***.
   c. In both cases: The displays will show an alarm due to the open switches. The P/N of the System and the S/N of the modules will also be visualised cyclically.
      The LED flashes. POWER ON
      The ALARM LED is on.
      The MISSING GRID LED is on.
5. One at a time, close the DC switches in position 1 (Figure 6-8D):
   a. The display of the module relative to the closed switch will signal the alarm that the AC switch is still open.
      The LED flashes. POWER ON
      The ALARM LED is on.
      The MISSING GRID LED is on.
6. Close the AC switch on position 1, i.e. turning it clockwise:
   a. The display of the modules will no longer signal the alarm that the AC switch is still open.
      The LED flashes. POWER ON
      The ALARM LED goes off (unless there are anomalies).
      The MISSING GRID LED goes off (unless there are anomalies on the network).
   b. The fans are activated if the DC voltage is sufficient to leave the energy saving mode* (SE). the DC voltage

      (in the energy saving mode, indicated by the letters SE, the system sets itself in a monitoring-only condition and the ventilation system of the modules is deactivated)
   c. The display shows a “WAITING FOR SUN” message if the DC voltage is not sufficient to allow for connection to the grid.

d. If the primary conditions[1] (presence of DC and AC voltage) are satisfied, the system will automatically connect to the AC grid:

- The Slaves are connected to the grid with the Master.
- ***The LED is on POWER ON***
- At every connection, the system makes a complete scan of the field to identify the maximum power point. In this phase there is a sudden increase in power, then a decrease, and then another increase. This phase lasts less than 5 seconds.

e. At this point, the Master or Masters will show the power sent to the grid and other parameters. The visualisation of various parameters on the display occurs cyclically unless the "locked" symbol appears on the display. Otherwise, it is necessary to act manually (by means of the arrows) to obtain the visualisation.

Chapter §13

[1] The conditions for connection to the grid vary according to the country in which the inverter is sold.

12.3. Sequence for commissioning the 1Master/N.Slave systems (Inverter ≥165kW)

The procedure for commissioning AURORA in a 1 Master / n Slave system is the following:

Chapter §6.2.3

1. Make sure that the grid switch is on 0 (horizontal position).
2. Make sure that the external DC switch is set to 0 (OPEN).
3. Make sure that the DC switches are on 0 (Figure 6-8 - A).
4. Make sure that the main QS2 switch is in ON position (up): the control logic of the system is activated and the displays on the front are on.
5. Check the front signalling displays on each framework:

Chapter §5.2.5

   a. In this case 1Master-nSlave ***the MASTER LED is on*** only on the Master module. The presence of several ***MASTER LEDS on*** in a 1master-nSlave group, indicates the presence of an anomaly.

   b. The displays will show an alarm due to the open switches. The P/N of the System and the S/N of the modules will also be visualised cyclically.
   The LED flashes. POWER ON
   The ALARM LED is on.
   The MISSING GRID LED is on.

6. One at a time, close the DC switches in position 1 (Figure 6-8 - D).
7. After closing all DC switches, close the external DC disconnecting switch:
   a. The display of the modules will signal the alarm that the AC switch is still open.
   The LED flashes. POWER ON
   The ALARM LED is on.
   The MISSING GRID LED is on.
8. Close the AC switch on position 1, i.e. turning it clockwise:
   a. The display of the modules will no longer signal the alarm that the AC switch is still open.
   The LED flashes. POWER ON
   The ALARM LED goes off (unless there are anomalies).
   The MISSING GRID LED goes off (unless there are anomalies on the network).
   b. The fans are activated if the DC voltage is sufficient to leave the energy saving mode* (SE). the DC voltage
   (in the energy saving mode, indicated by the letters SE, the system sets itself in a monitoring-only condition and the ventilation system of the modules is deactivated).
   c. The display shows a “WAITING FOR SUN” message if the DC voltage is not sufficient to allow for connection to the grid.

d. If the primary conditions[1] (presence of DC and AC voltage) are satisfied, the system will automatically connect to the AC grid:

- The Slave are connected to the grid with the Master.
- ***The LED is on. POWER ON***
- At every connection, the system makes a complete scan of the field to identify the maximum power point. In this phase there is a sudden increase in power, then a decrease, and then another increase. This phase lasts less than 5 seconds.

e. At this point, the Master or Masters will show the power sent to the grid and other parameters. The visualisation of various parameters on the display occurs cyclically unless the "locked" symbol appears on the display. Otherwise, it is necessary to act manually (by means of the arrows) to obtain the visualisation.

Chapter §13

[1] The conditions for connection to the grid vary according to the country in which the inverter is sold.

13. INTERACTIVE DISPLAY

13.1. How the display functions

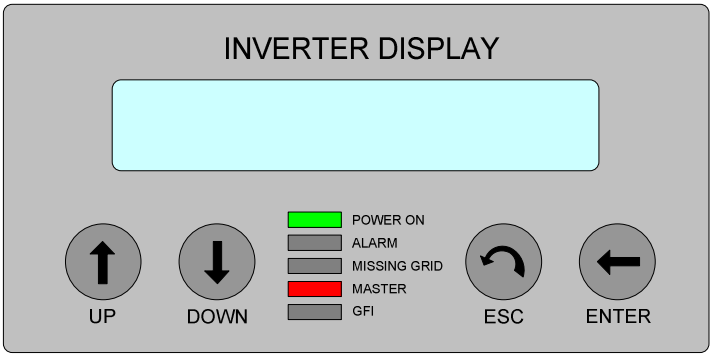


Figure 13-1: Display of the 55kWp module

The two-line LCD display (Figure 13-1) is located on the front panel of each 55kWp module and shows the following information:

- The functioning state of the inverter and the statistical data.
- Service messages for the operator.
- Alarm messages.

During normal functioning, the data are shown cyclically. The displays change every 5 seconds, or they can also be changed manually by pressing the **UP** and **DOWN** keys.
In any case, to return to the preceding menu, just press the ESC key.

Activation of cyclical scrolling is indicated by the 2 arrows in the top left corner of the display.

Scrolling can be blocked by pressing the **ENTER** key. The padlock symbol will appear.

Cyclical arrows	
Padlock	

The display shows only 2 lines, therefore to scroll up and down the items or to gain access to the submenus of the items, use the **UP** and **DOWN** side keys.

The selected item, is highlighted by an arrow on the left side of the display. Upon selection of the chosen item, type **ENTER** to enter the submenu.

13.2. Password entry

If a password is requested, carry out the following procedure:

The default password is 0000. It can be modified from the settings menu Figure 13-3.

Using the display keys, you can enter the numbers:

- Pressing **ENTER** you scroll from one number to another (from left to right).
- Pressing **ESC** you return to the preceding number (from right to left).
- By pressing ESC several times you will return to the previous menus.
- **DOWN** scrolls downwards through the numbers (from 9 to 0)
- **UP** scrolls upwards through the numbers (from 0 to 9)

After typing the correct password, press **ENTER**, accessing the various information items saved in the protected section.

13.3. The display LED

The display is provided with several signalling LEDS:

POWER ON: [GREEN LED] Indicates the presence of energy and of connection / disconnection from the grid.

ALARM: [RED LED] Indicates a problem.

GFI: [RED LED] Not used at present.

MISSING GRID: [RED LED] If on, it indicates lack of voltage of a grid or an anomaly of the grid. The lighting may be due to the open grid switch (in this signalled on the display).

MASTER: [RED LED] Indicates whether the module is Master (on) or Slave (off).

The following table shows the 5 configurations which can be indicated during the operation:

Table 13-1: Meaning of the display LEDs

STATE OF LEDs	MEANING
POWER ON ALARM MISSING GRID MASTER GFI	• All the LEDS are off. • The module is not receiving power and all signals are absent.
POWER ON ALARM MISSING GRID MASTER GFI	• The module is connected to the grid. • The module is Master.
POWER ON ALARM MISSING GRID MASTER GFI	• The module is connected to the grid. • The module is Slave.
POWER ON ALARM MISSING GRID MASTER GFI	• The module is not connected to the grid. • The module is Master. • The AC grid is absent or out of range. • The module is in alarm state due to a problem in the grid.
POWER ON ALARM MISSING GRID MASTER GFI	• The module is not connected to the grid. • The module is Master. • The module is in alarm state due to a problem.

NOTE: In the table, the uniform colour indicates the fixed LED on, while the alternate colour indicates the flashing.

13.4. Functional diagram of the display (Menu)

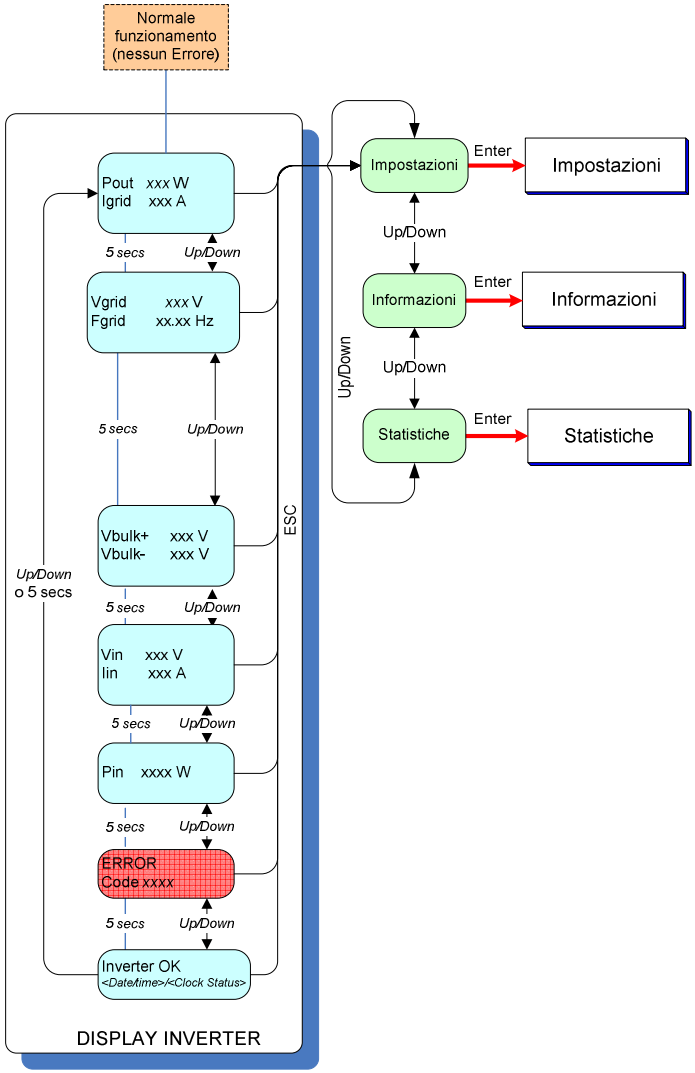


Figure 13-2: Functional diagram of the display (Main Menu)

The Figure 13-2 shows the information displayed during normal operation. By pressing **ENTER, ESC, UP or DOWN**, you can scroll among menus as indicated.

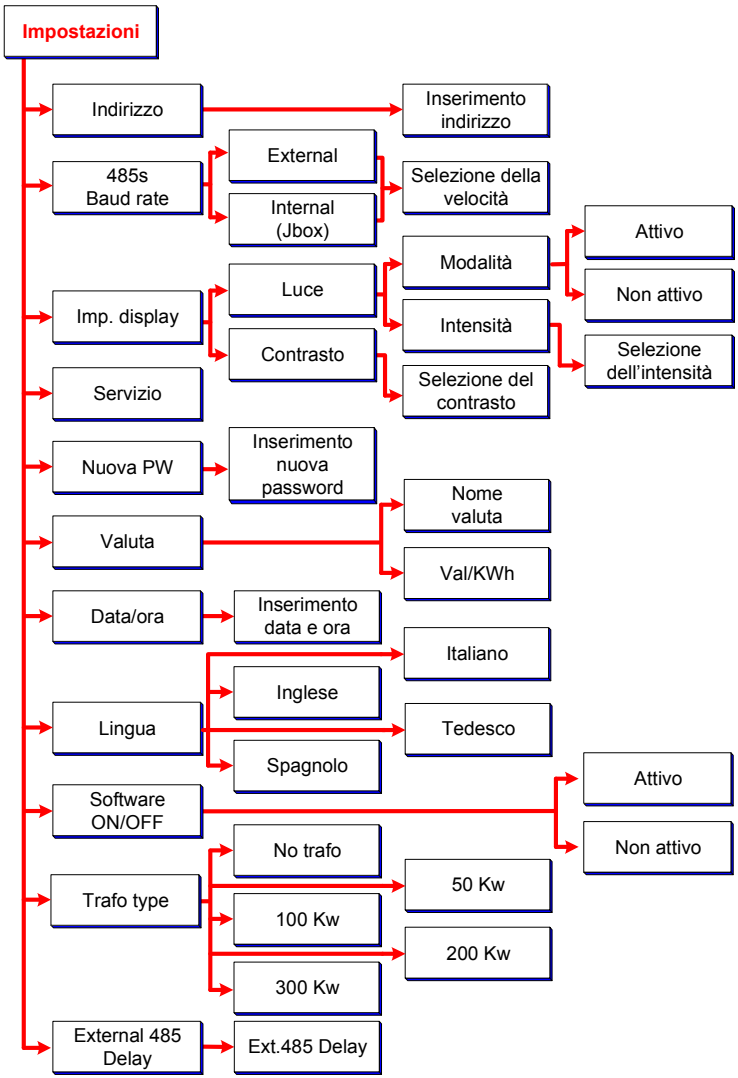


Figure 13-3: Functional diagram of the display (Setting menu)

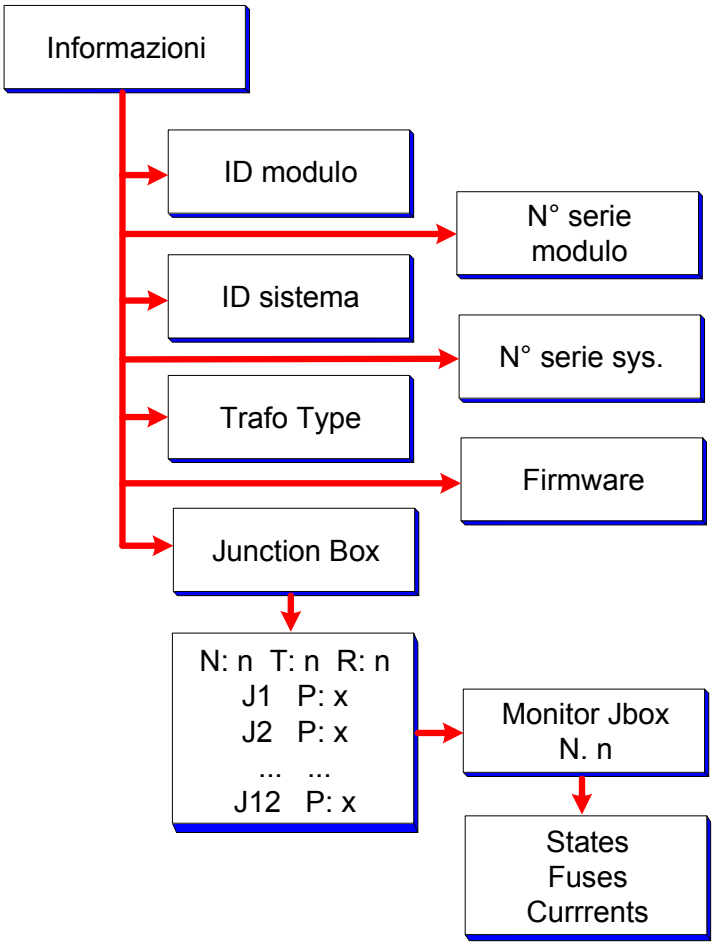


Figure 13-4: Functional diagram of the display (Information menu)

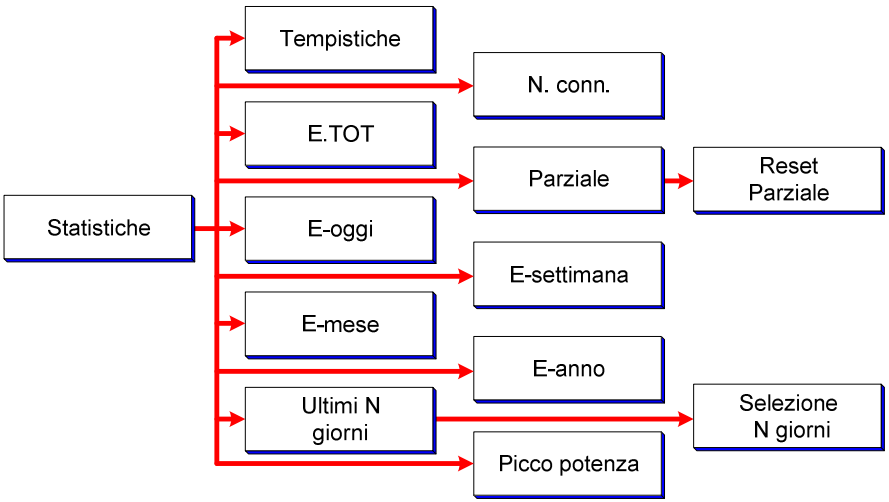


Figure 13-5: Functional diagram of the display (Statistics menu)

13.5. Information

By selecting the INFORMATION menu, the display will show a submenu as shown in Figure 13-4.

13.5.1 ID. module

By selecting this item, you will see the Part Number of the module selected which is part of the system.

13.5.2 Mod. SeriesNo.

By selecting “Mod.Series N." the following information will be shown:

- **Series No.**: Series number of the selected module.
- **Wk xx Yr xx**: Production week (Wk) and year (Yr) of the module.

13.5.3 System ID

Selecting this item, you will see 4 figures indicating the Part Number of the system.

13.5.4 Sys. Series No.

By selecting “Sys. Series No." the following information will be shown:

- **Series No.**: Series number of the rack.

13.5.5 Trafo type

By selecting “Trafo type”, the following information will be shown:

- **Trafo yes/no**: Presence of the transformer or not.
- **Mod. No.**.: Number of modules in the system.

13.5.6 Firmware

By selecting this item, the release of the software in the module will be shown.

13.5.7 Junction Box (only on the module designated for control)

This item of the menu allows for verification of the state of the StringCombs in the system.
By selecting “Junction Box”, the following information will be shown:

- **Nn, Tn, Rn**: (Nn) is number n of the StringCombs set by the installer. (Tn) is number n of the rack (Rack N.) to which the StringCombs refers. (Rn) is number n of the StringCombs detected by the module. R must coincide with N, unless there is a fault.
- **Jn, Px**: (Jn) is the StringComb with Field number n. Number n varies from 1 to 12. (Px) indicates the presence Y/N of the PVI-STRINGCOMB. There can be a maximum of 12.

13.5.7.1 States

This item of the menu allows for verification of the state of all the parameters of the StringCombs selected previously. These can be OK or NOT OK:

- **Fuses**: State of fuses.
- **Temp**: Temperature of the box.
- **Volt**: Voltage of the field.
- **Balance**: Unbalanced string currents.
- **Current**: String current.
- **Power**: StringComb supply.
- **Comm**.: Communication.
- **Cal**: Current calibration.

13.5.7.2 Fuses

This item of the menu allows for verification of the state of the single fuses of the StringComb selected previously. These can be OK or NOT OK:

- **F1**: State of fuse F1.
- **….**
- **F20**: State of fuse F20.

13.5.7.3 Currents

This item of the menu allows for verification of the state of the currents of the StringComb selected previously. These can be OK or NOT OK:

- **I1**: State of current I1.
- **….**
- **I20**: State of current I20.

13.6. Statistics

By selecting the STATISTICS menu, the display will show a submenu as indicated in Figure 13-5.

13.6.1 Timing

By selecting "Timing", the following information will be shown:

- **Life**: Total operating time.
- **Grid**: Hours of connection to the grid.

13.6.2 N. Conn (Number of Connections)

By selecting "N. Conn", the number of connections with the grid will be shown.

13.6.3 E-Tot

By selecting "E-Tot", the following information will be shown:

- **E**: Total energy produced.
- **Val**.: Economic gain.

13.6.4 Partial

By selecting "Partial", the following information will be shown:

- **PT**: Total operating time since the last time the count was reset.
- **E**: Total energy produced since the last time the count was reset.
- **Val.**: Economic gain since the last time the count was reset.

Partial Reset: Allows to reset the preceding parameters to zero.

13.6.5 E-today

By selecting "E-Today", the following information will be shown:

- **E**: Total energy produced today.
- **Val.**: Economic gain today.

13.6.6 E-Week

By selecting "E-Week", the following information will be shown:

- **E**: Total energy produced this week.
- **Val.**: Economic gain this week.

13.6.7 E-Month

By selecting "E-Month", the following information will be shown:

- **E**: Total energy produced this month.
- **Val.**: Economic gain this month.

13.6.8 E-Year

By selecting "E-Year", the following information will be shown:

- **E**: Total energy produced this year.
- **Val.**: Economic gain this year.

13.6.9 Last N Days

By selecting "Last N Days", the following information will be shown:

- **E**: Total energy produced in the last days indicated by N.
- **Val.**: Economic gain in the last days indicated by N.

13.6.10 Power Peak

By selecting "Power Peak", the following information will be shown:

- **PPA**:Value of the power peak at switching on.
- **PPT**: Value of the power peak today.

14. BEFORE USING THE SOFTWARE

The software produced for the PVI-XXX.0(-TL) allows for setting the transmission parameters (e.g. baud rate) and for control (e.g. power limit) and for monitoring the electrical dimensions (e.g. values of the phase voltages).

To be able to communicate with PVI-XXX.0(-TL), the computer used must have a free COM serial port.

Since, as already described, the serial transmission standard of the PVI-XXX.0(-TL) is the RS485, while the COM port of the computer is used on the RS232 standard, **an Aurora RS232/485 adapter must be used** (Aurora 232/485 Converter).

Chapter §8

14.1. Software installation

NOTICE

Place the CD provided with the PVI-XXX.0(-TL) into the computer and launch the "setup.exe" program, then follow the instructions on the screen.

In conclusion, the icon "Aurora CENTRAL CVI" will appear on your Desktop[1] and in the position:

Start →
Programs →
Aurora CENTRAL CVI

The next chapter shows how to use the PVI-XXX.0(-TL) configuration and monitoring program.

[1] Future software versions could have a different icon.

15. MONITORING AND CONFIGURATION INTERFACE

15.1. Conventions used

In this chapter the following conventions are used in the text:

- [**BUTTON**]: Indicates a button
- (*selection list*): Indicates a list for selection.
- *Menu name*: Indicates the name of a menu.
- *window name.*

15.1.1 Rack and Modules

Hereinafter, the single 55kWp boxes will be indicated with "**Modules**".
The name "**Rack**" indicates a system composed of several modules. Each Rack can have up to 6 Modules.

In this manual the name Tower or Rack have the same meaning.

15.2. Access levels

The software allows for two access level:

- **Standard (User)**: this allows only for monitoring. Some windows of the program have hidden and/or limited functions.
- **Advanced (Technic)**: this allows for monitoring and additional functions. All the program functions are enabled except for some which are for the exclusive use of the constructor.

The password for advanced access is "aurora"[1].

[1] The password cannot be changed. Always use lower case.

15.3. Diagram of the monitoring software

The following "map" simplifies the learning of the monitoring program structure. The next paragraphs will describe in detail the single blocks of the diagram.

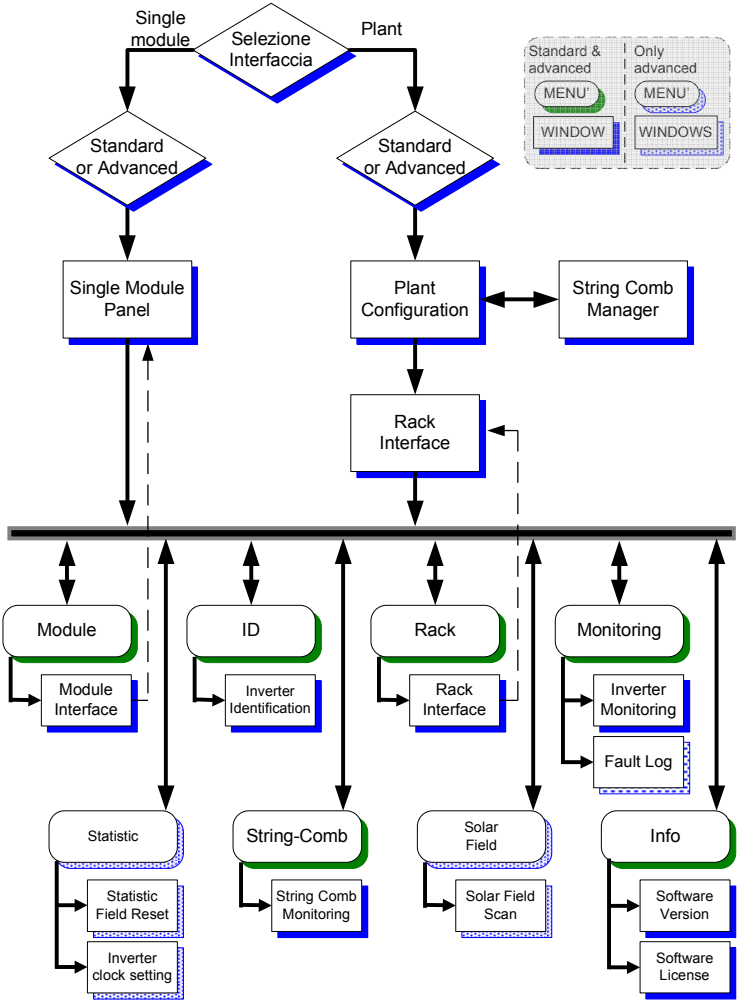
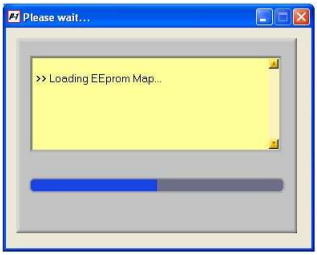


Figure 15-1: Software map of monitoring the

15.4. Use of the monitoring program

➲ Click twice on the icon of the "Aurora Central CVI" program and wait for the following window to appear:



➲ Choose (*PC COM Ports*) to which the RS485/232 adapter is connected. COM port

➲ Choose the communication speed (COM Baud-Rate).

➲ Press [**COM SET**].

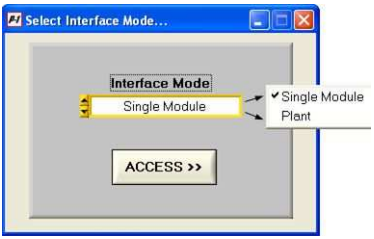


Figure 15-2: Choice of the interface type

➲ Choose the type of visualisation through (*Interface Mode*):

- *Single Module*: all modules connected to the RS485 line are visualised.
- *Plant*: all racks connected to the RS485 line are visualised.
- Press [**ACCESS >>**].

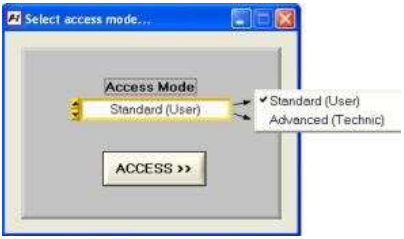


Figure 15-3: Choice of Standard or Advanced mode

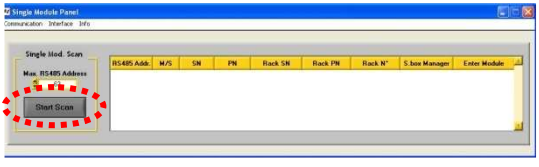
➲ Now select the standard or advanced access mode.

For the “advanced” mode it is necessary to insert the password “aurora”. In "standard" mode, some menus will be disabled.

➲ Based on the choice done before, the *Single Module Panel* (Figure 15-4) or *Plant Configuration* window will appear.

Chapter §15.4.2

15.4.1 Single Module Panel



After scanning

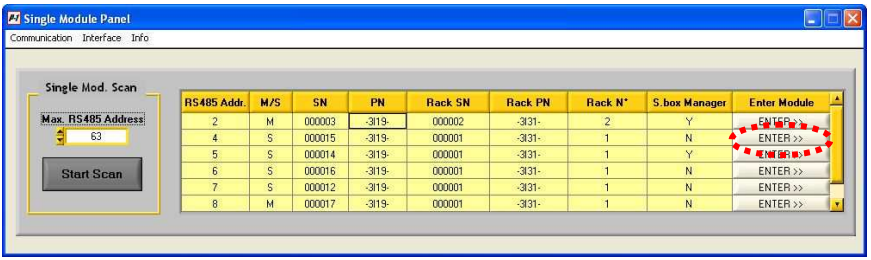

Single Module Panel
Communication Interface Info
Single Mod. Scan
Max. RS485 Address
63
Start Scan
RS485 Addr. M/S SN PN Rack SN Rack PN Rack N° S.box Manager Enter Module
2 M 000003 -3I19- 000002 -3I31- 2 Y ENTER >>
4 S 000015 -3I19- 000001 -3I31- 1 N ENTER >>
5 S 000014 -3I19- 000001 -3I31- 1 Y ENTER >>
6 S 000016 -3I19- 000001 -3I31- 1 N ENTER >>
7 S 000012 -3I19- 000001 -3I31- 1 N ENTER >>
8 M 000017 -3I19- 000001 -3I31- 1 N ENTER >>

Figure 15-4: Single Module Panel

➲ Set the limit of the address on (Max RS485 Address): in this way the program, in order to reduce time, will scan to find all the modules within a limited number of addresses.

➲ Click on the button [**Start Scan**]: the system will search for all the connected and functioning modules.

➲ The window shows a summary table relative to all models found. The parameters indicated are the following:

RS485 Addr.: Address assigned on RS485.
M/S: M=Master, S=Slave
SN: Series number of the Module
PN: Module code
Rack SN: Series number of the Rack to which it belongs
Rack PN: Code of the Rack to which it belongs
Rack No.: ID number of the Rack
S.Box Manager: Indicates whether the module is used for management of data with the boxes of the AURORA PVI-STRINGCOMB(-S) string.

➲ By pressing the corresponding [**ENTER >>**] button, access is gained to the management of the selected module (Figure 15-9).

15.4.2 Plant Configuration

At first this window will be empty. This is because the first time the program has to scan to see how the plant is configured.

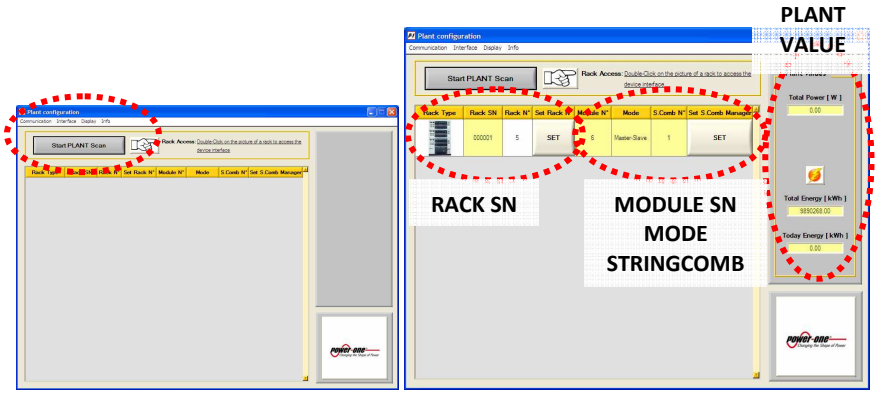


Figure 15-5: Plant Configuration

➲ Click on the button [**Start PLANT Scan**]: the system will search through all the connected and functioning Racks.

The screen of Figure 15-5 shows the following information:

- **Plant value**: will display information about the instantaneous power output (W), the daily energy and the total energy produced (kWh).
- The rack serial number (Rack SN) and identity number (Rack No.), the latter being assigned to the rack and to all the modules to identify the whole tower. The rack number can be changed by entering a new number using the [**Set Rack Number**] button.
- The number of modules contained in the rack (Module No.), operating mode (Mode) and the number of connected string-boxes (S.Comb N.)[1]. By pressing the [**Set S.Comb Manager**] button you can access the (Figure 15-6) menu by which, pressing the [**SELECT>>**] button, the management and monitoring of the PVI-STRINGCOMB is assigned to the corresponding module.

It is preferable to assign the string-box management to a 55kW slave module, if present.

[1] Before assigning the stringcomb manager it is necessary to configure the RS485 line of the string boxes by means of the stringcomb software installer (see stringcomb manual).

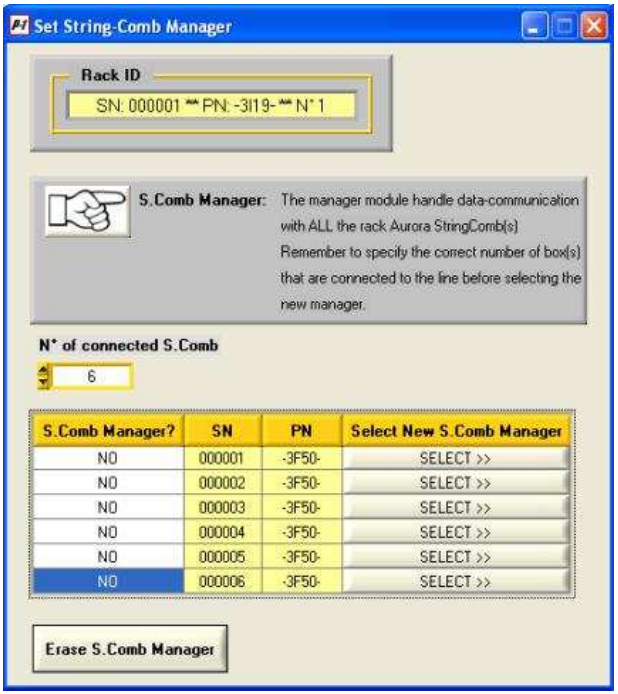

Set String-Comb Manager
Rack ID
SN: 000001 ** PN: -3I19-** N°1
S.Comb Manager:
The manager module handle data-communication with ALL the rack Aurora StringComb(s)
Remember to specify the correct number of box(s) that are connected to the line before selecting the new manager.
N° of connected S.Comb
6
S.Comb Manager?
SN
PN
Select New S.Comb Manager
NO 000001 -3F50- SELECT >>
NO 000002 -3F50- SELECT >>
NO 000003 -3F50- SELECT >>
NO 000004 -3F50- SELECT >>
NO 000005 -3F50- SELECT >>
NO 000006 -3F50- SELECT >>
Erase S.Comb Manager

Figure 15-6: Choice of the StringComb Manager

- By double-clicking on the tower image you can access the rack management menu (Figure 15-11) in which it is possible to control and identify an alarm, and to gain access to the single module.

- From the Display menu, it is possible to open a system monitoring page that is very useful to create a small monitoring system (Figure 15-7).

The LOGO, the image and system information can be all customised.

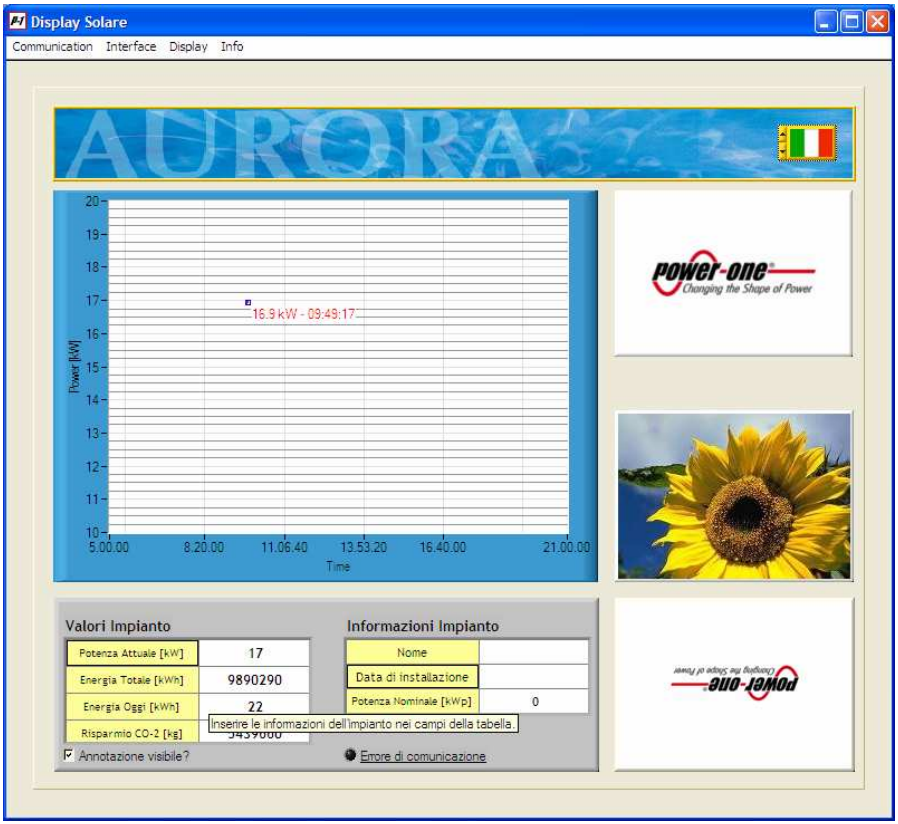


Figure 15-7: Display of Solar monitoring

15.4.3 Rack Interface

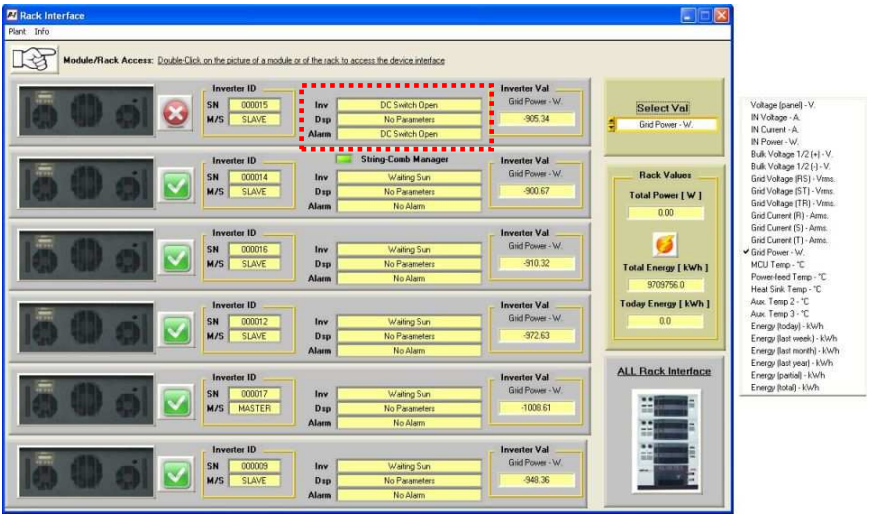


Figure 15-8: Rack Interface – Rack Management

In this mode, the main parameters and the state of every module of the system can be observed:

- The symbol indicates that the module is operative, while the symbol identifies the module in alarm mode. In the area indicated by the dotted line, the state of the Supervisor (Inv), of the digital signal processor (Dsp) and of the type of alarm (Alarm) can be read.
- **Inverter ID:** shows the serial number (SN) and the state of the master or slave of the module (M/S).
- **Inverter Val**: shows the value of the size selected from the list (*Select Val)*, in the top right side.

Figure Figure 15-8 shows the content of the list where the following sizes can be seen:

- ✓ **Voltage [Panel]**: Voltage read by the supervisor [Vrms]
- ✓ **IN Voltage**: Field voltage [Vrms]
- ✓ **IN Current**: DC input current [Arms]
- ✓ **IN Power**: Input power [W]
- ✓ **Bulk Voltage ½ (+)**: DC voltage on the internal capacities + [Vdc]
- ✓ **Bulk Voltage ½ (-)**: DC voltage on the internal capacities - [Vdc]
- ✓ **Grid Voltage (RS)**: Grid voltage linked to phases R-S [Vrms]
- ✓ **Grid Voltage (ST)**: Grid voltage linked to phases S-T [Vrms]
- ✓ **Grid Voltage (TR)**: Grid voltage linked to phases T-R [Vrms]
- ✓ **Grid Power (W)**: Power sent to the grid
- ✓ **MCU Temp**: Supervisor temperature [°C]
- ✓ **Power Feed Temp**: Internal power supplier temperature [°C]
- ✓ **Heatsink Temp**: Power dissipater temperature [°C]

- ✓ **Aux Temp 2**: N/A (the data visualised is not used)
- ✓ **Aux Temp 3**: Framework environment temp. sensor [°C]
- ✓ **Energy (today)**: Energy produced today [kWh]
- ✓ **Energy (last week)**: Energy produced last week [kWh]
- ✓ **Energy (last month)**: Energy produced last month [kWh]
- ✓ **Energy (last year)**: Energy produced last year [kWh]
- ✓ **Energy (partial)**: Energy produced since the last re-setting [kWh]
- ✓ **Energy (total)**: Total energy produced until today [kWh]

➲ By double clicking on the image of the single module you can access the management menu of the single module (Figure 15-10).

➲ By double clicking on the image of the rack, you return to the rack interface menu (Figure 15-11).

You can access the management menu of the single module (Figure 15-10) as indicated above or, otherwise, by choosing "single module" in Figure 15-2 and pressing the [**ENTER>>**] button of the *Single Module Panel*window.

15.4.4 Menus bar

From the standard or advanced mode, you may access the following menus:

Menus in Standard mode

Module	→ Module interface[1]
Rack	→ Rack interface[2]
ID	→ Inverter Identification.
Monitoring	→ Inverter Monitoring.
String-Comb	→ StringComb monitor.[3]
Info	→ Software version.
	→ Software license.

Menus in Advanced mode

Module	→ Module interface[1]
Rack	→ Rack interface[2]
ID	→ Inverter Identification.
Monitoring	→ Inverter Monitoring.
	→ Fault Log.
Statistic	→ Statistic field - reset.
	→ Inverter clock settings.
String-Comb	→ StringComb monitor.[3]
Solar filed	→ Solar field scan.
Info	→ Software version.
	→ Software license.

Module interface and Rack interface show the relative windows illustrated in paragraphs.

Chapter §15.4.1
Chapter §15.4.3

The functions (windows) available via these menus are explained in detail below.

[1] active in single module mode
[2] active in single plant mode
[3] Active only on modules dedicated to StringComb management

15.4.5 Inverter Identification

The window which summarises the plate data of a single module is the following:

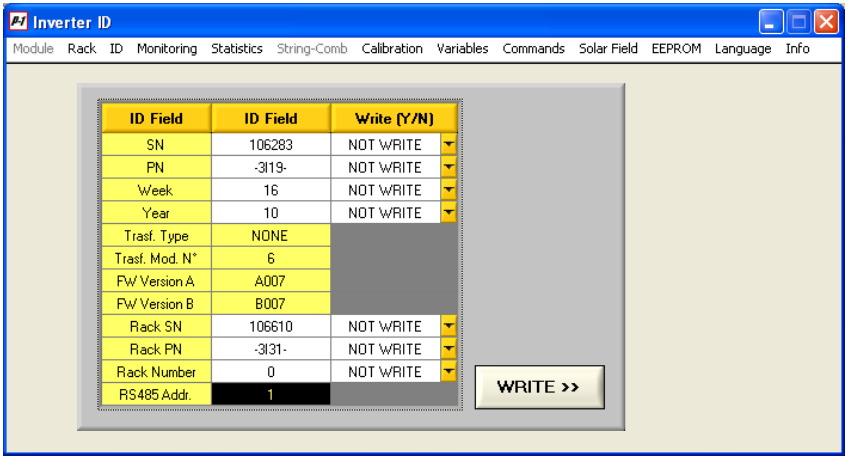


Figure 15-9: Inverter ID – Single Module Interface

The parameters listed are the following:

- ✓ **SN**: Series number of the module
- ✓ **PN**: Part number of the module
- ✓ **Week**: Week of production
- ✓ **Year**: Year of production
- ✓ **Transf. Type**: Type of connected transformer
- ✓ **Transf. Mod. No.**: Number of modules connected to the rack
- ✓ **FW Version A**: DSP firmware revision
- ✓ **FW Version B**: Supervisor firmware revision
- ✓ **Rack SN**: Series number of the rack
- ✓ **Rack PN**: Part number of the rack
- ✓ **Rack Number**: Identification number of the rack in the plant
- ✓ **RS485 Addr.**: Address RS485

15.4.6 Inverter Monitoring

This window allows for monitoring a single module on the rack side.

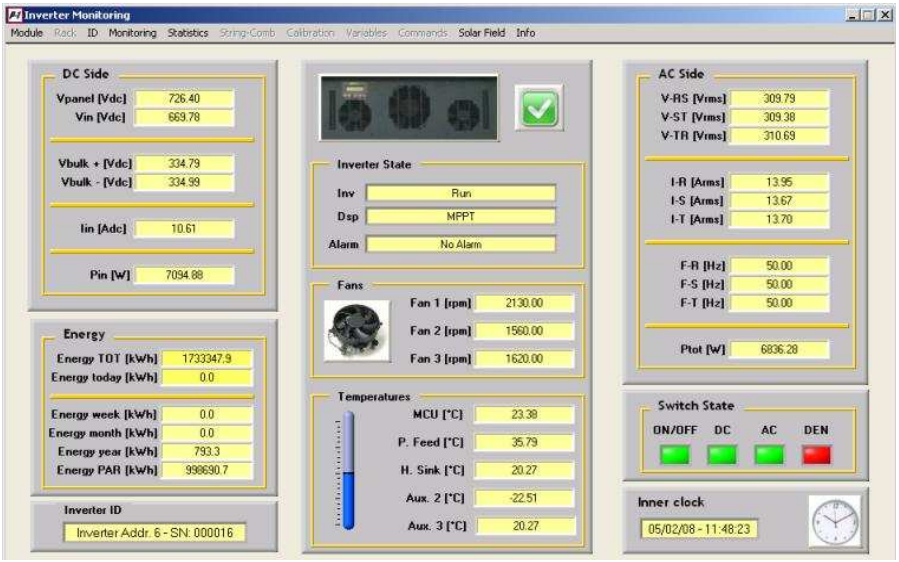


Figure 15-10: Inverter Monitoring

- **DC Side**: in this area, the DC electrical dimensions are collected.
- **Energy**: shows the total and partial energy of the module.
- **Inverter State**: the state of the inverter
- **Fans**: shows the rotation speed of the module fans.
- **Temperatures**: shows the temperature of the microprocessor (MCU), of the power supplier (P.Feed), of the dissipater (H.sink) and of the framework (Aux. 3). The Aux2 indication is not used.
- **AC Side**: indicates the voltages, currents, frequency of the three phase triad and the power exported from the module.
- **Switch state**: closed switches are indicated in green, and open switches in red.
  ON/OFF: Remote ON/OFF
  DC: DC switch position
  AC: AC switch position
  SPD: Indication of the OVR DC state.

15.4.7 Rack Monitoring

This window allows for monitoring all modules that are part of the rack.

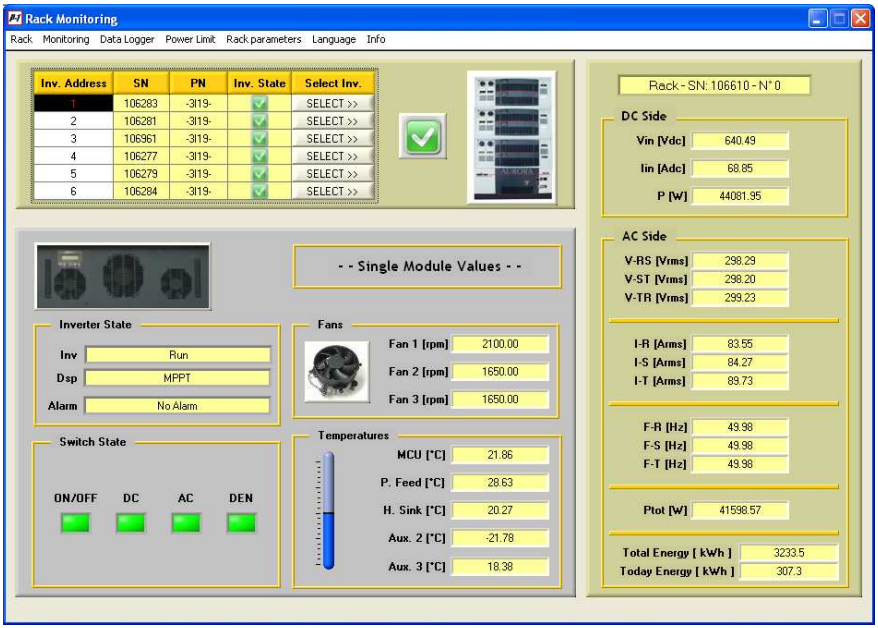


Figure 15-11: Rack Monitoring

- **DC Side**: in this area, the DC electrical dimensions are collected.
- **AC Side**: indicates the voltages, currents, frequency of the three phase triad and the power exported from the module.
- **Energy**: shows the total and partial energy of the module.
- **Select**: offers the possibility to choose the module to be displayed and that is part of the rack.
- **Single Module Values**: the state of the selected inverter.
- **Fans**: shows the rotation speed of the module fans.
- **Temperatures**: shows the temperatures as in the Inverter Monitoring.

  Switch state: closed switches are indicated in green, and open switches in red as in Inverter Monitoring.

15.4.8 Fault Log

This window lists the faults/alarms registered by the selected module:

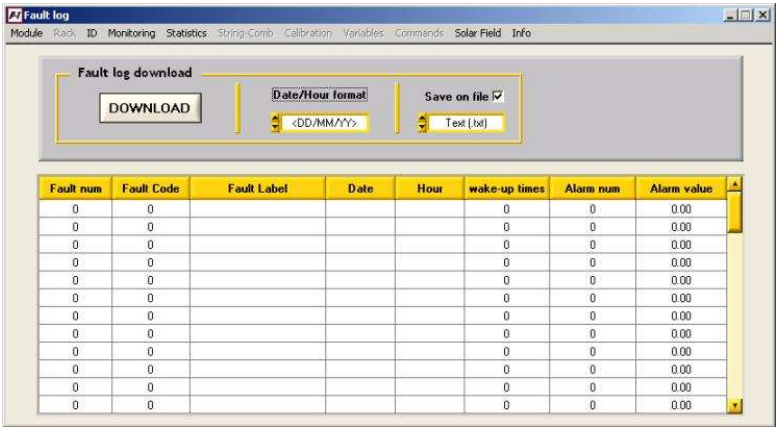


Figure 15-12: Window for saving the fault list

The (*Date/Hour format*) box allows to specify the format of the date on which the data will be visualised. The (*Save on file*) box, if enabled, allows to save the fault list in text (.txt) format or in excel (.xls) format, based on the choice made in the box below.
By pressing the [**DOWNLOAD**] button, the system downloads the faults from the inverter, displaying a wait window, and then the list of the downloaded faults (Figure 15-14). Afterwards, a window will appear to request saving the data to a file (Figure 15-13).

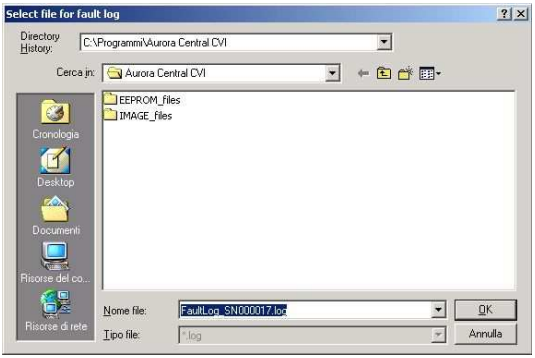
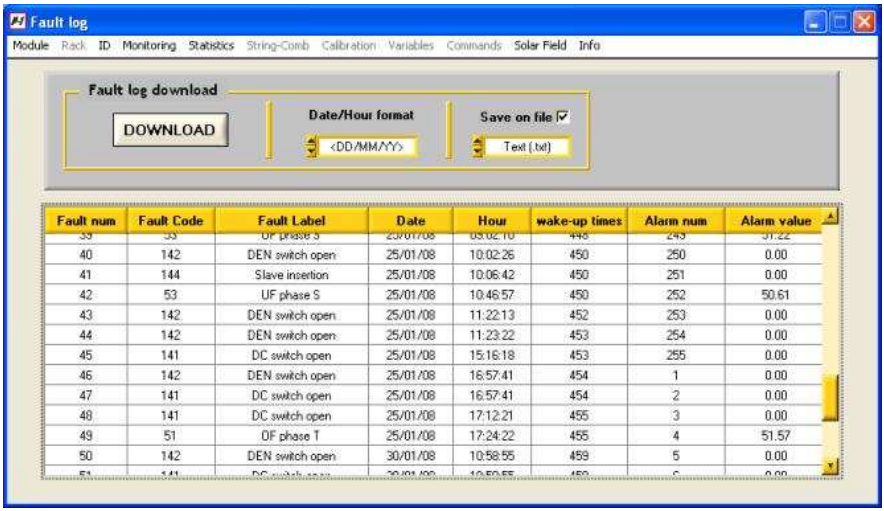


Figure 15-13: Window for saving the fault list



Fault num	Fault Code	Fault Label	Date	Hour	wake-up times	Alarm num	Alarm value
40	142	DEN switch open	25/01/08	10:02:26	450	250	0.00
41	144	Slave insertion	25/01/08	10:06:42	450	251	0.00
42	53	UF phase S	25/01/08	10:46:57	450	252	50.61
43	142	DEN switch open	25/01/08	11:22:13	452	253	0.00
44	142	DEN switch open	25/01/08	11:23:22	453	254	0.00
45	141	DC switch open	25/01/08	15:16:18	453	255	0.00
46	142	DEN switch open	25/01/08	16:57:41	454	1	0.00
47	141	DC switch open	25/01/08	16:57:41	454	2	0.00
48	141	DC switch open	25/01/08	17:12:21	455	3	0.00
49	51	OF phase T	25/01/08	17:24:22	455	4	51.57
50	142	DEN switch open	30/01/08	10:58:55	459	5	0.00

Figure 15-14: Fault log

The following information is given in the fault log column:

- ✓ **Fault num**: Progressive line number.
- ✓ **Fault code**: Code assigned to the fault.
- ✓ **Fault label**: Label describing the fault.
- ✓ **Date/hour**: Date and time when the fault occurred.
- ✓ **Wake-up times**: Progressive number of power start-ups.
- ✓ **Alarm num**: Progressive number indicating the number of alarms.
- ✓ **Alarm value**: Value of the dimensions which generated the fault.

15.4.9 Statistic Field Reset

This window allows for cancellation of the energy statistics values.

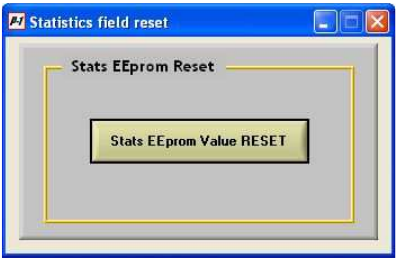
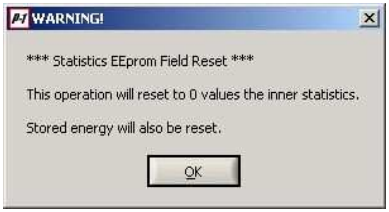


Figure 15-15: Eeprom Reset

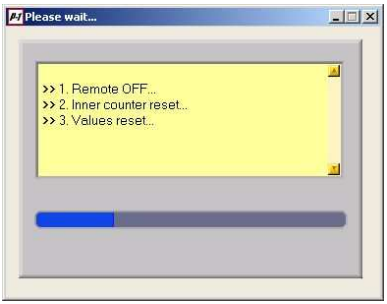
➲ By clicking on the [**Stats EEprom Value RESET**] the following warning window will appear:


WARNING!
*** Statistics EEprom Field Reset ***
This operation will reset to 0 values the inner statistics.
Stored energy will also be reset.
OK

➲ Press [**OK**], a window will open warning that this procedure will zero all the energy statistics and will ask whether the user wishes to keep the total and partial energy values produced:

➲ Confirmation of the reset operation will be requested. Choose [**YES**] or [**NO**]:

➲ If you choose [**YES**] a wait window will open for the reset operations:

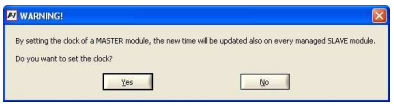


15.4.10 Inverter clock settings

This function allows for the system clock to be set.

➲ If the time is changed on a Slave module, the system warns that the modification will only affect that module.

➲ If the time is changed on a Master module, the system warns that the modification will also affect all the Slaves connected to that Master.


WARNING!
By setting the clock of a MASTER module, the new time will be updated also on every managed SLAVE module.
Do you want to set the clock?
Yes
No

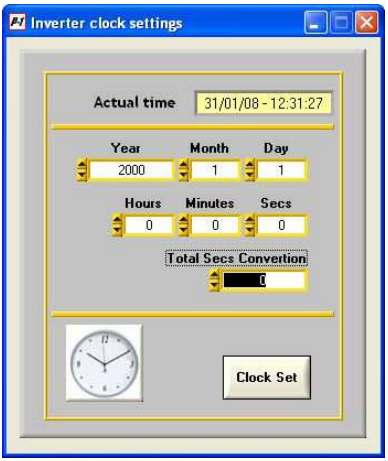


Figure 15-16: Inverter clock settings

➲ The window shows the current date and time; to change them, fill the field with the new data and press [**Clock set**].

15.4.11 String Comb monitoring

If the system has the string boxes (StringComb), this window will allow for the parameters of this apparatus to be monitored.

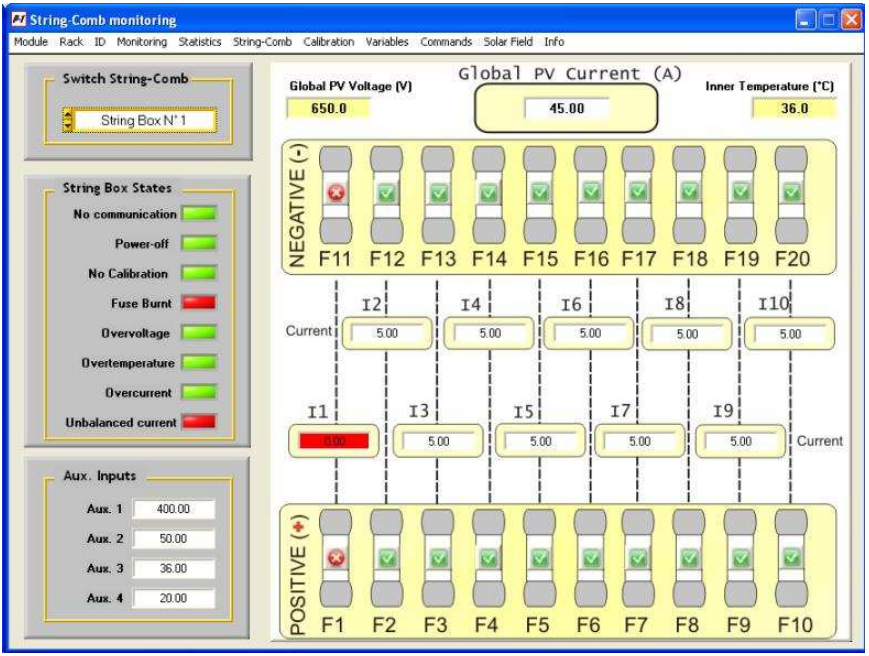


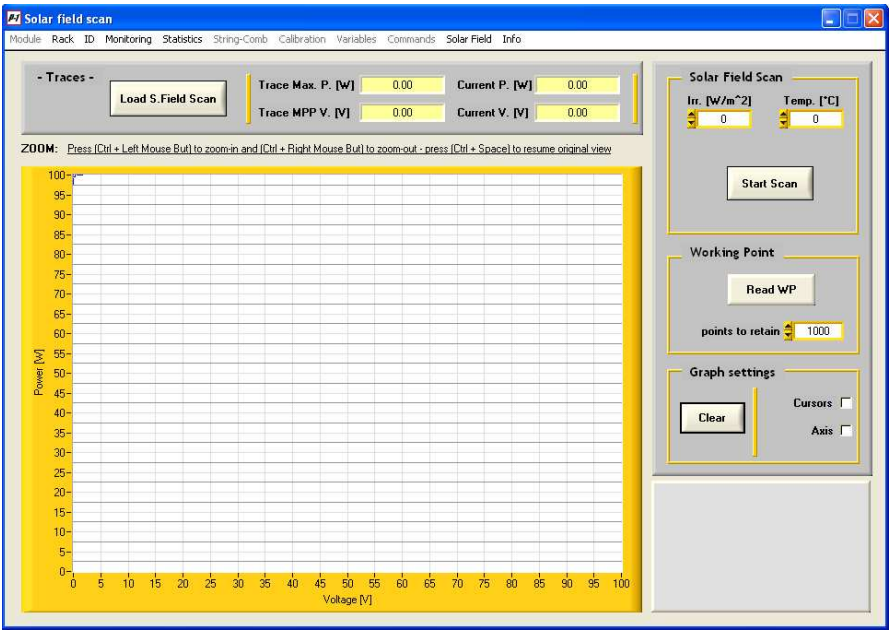
Figure 15-17: StringComb monitoring

To use this program, please consult the manual of the PVI-STRINGCOMB(-S): "**BOXES FOR THE STRING CONNECTION FOR PHOTOVOLTAIC APPLICATIONS"** supplied with the string boxes.

15.4.12 Solar field scan

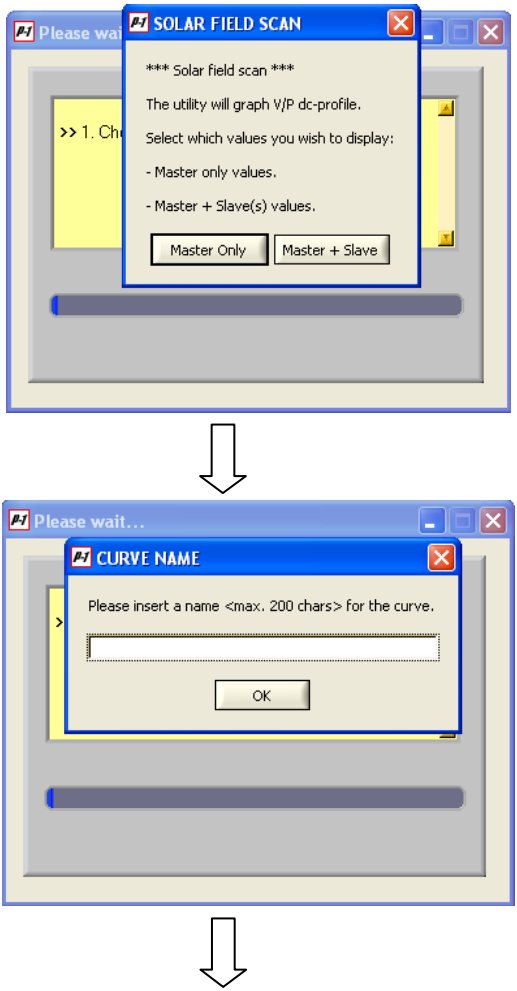
This function allows for scanning the photovoltaic field and gives the P-V curve of the field.

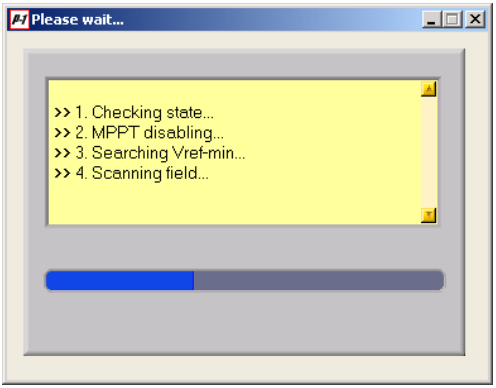
The following window is composed mainly of a blank area where the features detected in the field will be "drawn":


Solar field scan
Module Rack ID Monitoring Statistics String-Comb Calibration Variables Commands Solar Field Info
- Traces -
Load S.Field Scan
Trace Max. P. [W] 0.00
Current P. [W] 0.00
Trace MPP V. [V] 0.00
Current V. [V] 0.00
ZOOM: Press [Ctrl + Left Mouse But] to zoom-in and [Ctrl + Right Mouse But] to zoom-out - press [Ctrl + Space] to resume original view
Power [W]
Voltage [V]
Solar Field Scan
Irr. [W/m^2]
Temp. [°C]
Start Scan
Working Point
Read WP
points to retain 1000
Graph settings
Clear
Cursors
Axis

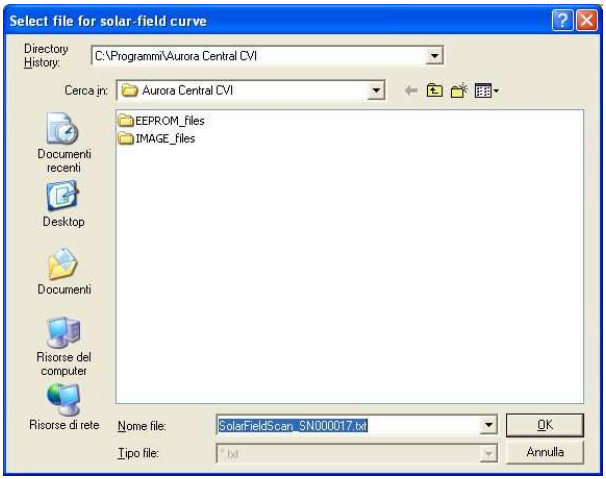
- **Solar Field Scan**: in this area, the environmental conditions can be indicated, by which the P-V characteristics can be measured. Press the [**Start Scan**] button to start the scan.
- **Working Point**: the [**Read WP**] button allows to visualise the work point and how many points to be shown in the graph.
- **Graph settings**: this allows for the visualisation of a classic cross cursor and the projection of the point on its axes. The [**Clear**] button completely cancels the graphic.

- If known, write the radiation and temperature values in the special boxes (this operation can also be omitted).
- Press the [**Start Scan**] button. The program asks whether the operator wishes to visualise the master curve ([**Master Only**] button) or the master with the slaves ([**Master + Slave**]button), requesting a name for the curve. After the confirmation [**OK**] the inverter will start the field scan.





➲ After the scan, the program asks for a name to be assigned to the data file.



➲ Enter a name and press [**OK**]. After the file has been saved, the curve is drawn (Figure 15-18)

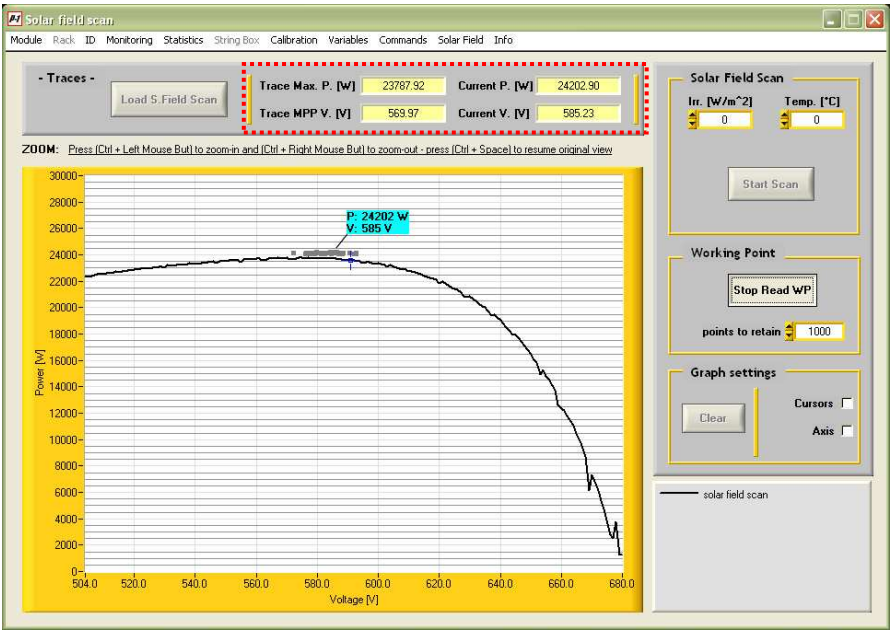


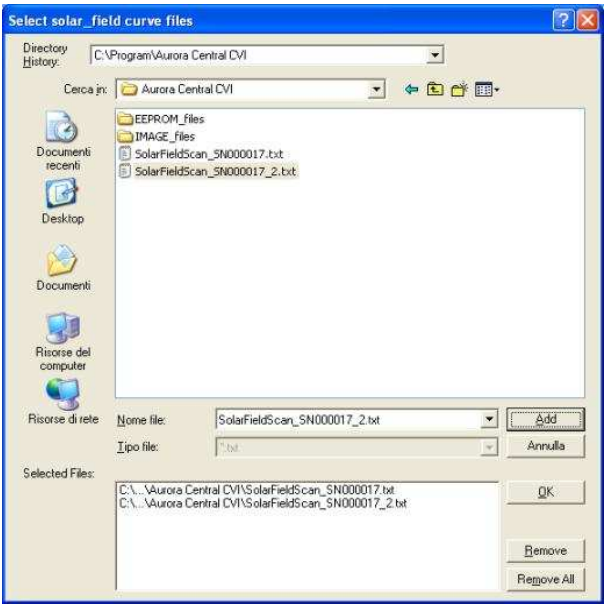
Figure 15-18: Solar Field Scan

In the area indicated by the dotted line at the top, the values of exported power and voltage are visualised, as well as the maximum points reached by the curve.
Pressing the [**Read WP**] button allows the visualisation of the work point as indicated in the example in Figure 15-18.

15.4.12.1 Loading and visualisation of the P-V curves saved

This function allows the P-V characteristics found to be saved in a file. In this way, an archive of the characteristics of the photovoltaic field will be created.
This function is useful in the installation /maintenance phase.

➲ By pressing the [**Load S. Field Scan**] button you can create a curve previously saved.

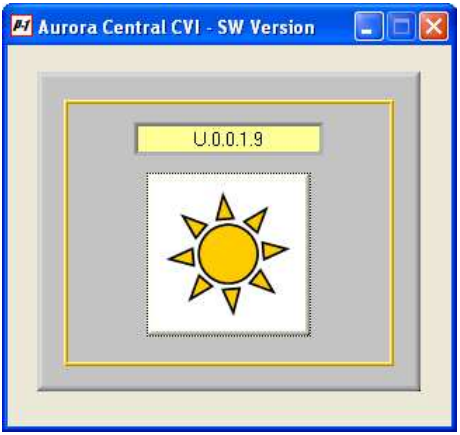


➲ Select the file that contains the curve and click on the [**Add**] button: in this way the selected curve will be added in the bottom window. Several curves may be visualised on the same graphs, by selecting them and clicking on [**Add**].

➲ In case of error, a selected curve can be removed by pressing the [**Remove**] button. By [**Remove All**] all curves may be removed.

15.4.12.2 Software Version

The window shows only the version of the software is being used.



Press the button to close the panel and return to the previous screen.

16. MAINTENANCE / REPAIRS

This chapter describes the operations necessary to disconnect the device in order to carry out internal repairs in safety conditions.
The type of disconnection depends on the action to be carried out. If the product is to be scrapped, it must first be completely disconnected from the DC and AC cables.

Chapter §17.7

To maintain the efficiency of AURORA PVI-XXX.0(-TL) and guarantee safety conditions, the maintenance operations described below are necessary. Maintenance also includes checking, and if necessary replacing components subject to wear during functioning.

The equipment is designed to provide a lifetime operation of not less than five years, in the environment and for the type of application specified. Unscheduled maintenance interventions are not generally predictable and are due to verify the installation and to replace faulty components.

The routine or unscheduled maintenance activities should be performed whenever possible during periods of lower production efficiency, in order to reduce costs.

DANGER

Since most interventions require the removal of the panels, it is vital to be sure that before switching the inverter on again all the panels have been correctly replaced, with particular care given to the front panels of the fuses and the relative earth connections.

16.1. Routine maintenance

Maintenance inside the PVI-XXX.0(-TL) must be carried out following the procedures shown in Table 16-1.

Table 16-1: TABLE OF ROUTINE MAINTENANCE

ACTIVITY	FREQUENCY*	PAR.
Cleaning of filters and grills and internal inspection for dirt and/or water	Every six months	§16.1.1
Tightening screws and check on colour changes	Every six months	§16.1.2
Checks of the AC BOX area	Annually	§16.1.3
Checks of the transformer ACBOX area	Annually	§16.1.3
Checks of Framework area	Annually	§16.1.4
Check of warning cards and signalling devices	Annually	§16.1.5

The frequency of maintenance operations could be increased according to the environmental conditions of the place where the inverter is placed

16.1.1 Filter cleaning

To gain access to the filters, some panels must be removed. In this case, a general visual inspection of the PVI-XXX(-TL) is advisable.

16.1.1.1 Filter of the Modules area

To clean the modules area, the convex panel/s on the front of the inverter must be removed. The removal of the filter is done by pulling the panel (Figure 16-1).

⚠ WARNING

Although it is possible to remove the front panel with the inverter switched on, it is advisable to switch it off before removal.

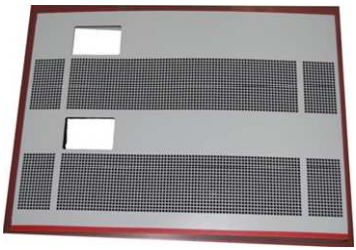


Figure 16-1: Front filter panel "55kWp Module Area"

After removing the panel, the filter fitted onto the internal side can be removed (Figure 16-2) and washed (do not use solvents!). Also clean the panel grills if necessary.

Figure 16-2: Removal of filter "55kWp Module Area"

NOTICE

Before replacing the filter, make sure that it is perfectly dry.

If no further checks are necessary, replace the panel.

16.1.1.2 ACBOX area filter

WARNING

Although it is possible to remove the front panel with the inverter switched on, it is advisable to switch it off before removal.

To clean this area, the lower panel on the front of the inverter must be removed (Figure 10-9 - F). The panel is illustrated in

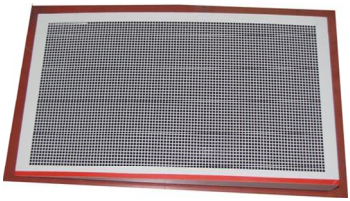


Figure 16-3: Front filter panel "ACBOX Area"

After removing the panel, the filter fitted onto the internal side can be removed (Figure 16-4) and washed (do not use solvents!). Also clean the panel grills if necessary.

Figure 16-4: Removal of filter "ACBOX Area"

NOTICE

NOTE: Before replacing the filter, make sure that it is perfectly dry and turn the knob of the power switch to 0.

If no further checks are necessary, replace the panel.

16.1.2 Visual and screw inspections

To check that screws are tight, the inverter must be opened. This implies the absolute necessity of disconnecting the whole system: on both the DC and the AC sides.

DANGER

If it is necessary to operate on exposed parts (not protected by panels), it is not sufficient to turn the grid switches (AC) and field switches (DC) to 0 (OFF), because the input cables are always under voltage!
Turn off and disconnect the inverter.

Chapter §17

MANDATORY UPSTREAM DISCONNECTION

Once the system has been disconnected and the inverter panels have been removed Figure 10-9 and Figure 16-5, in this case remove if necessary also panels on the other sides), check as indicated in the Table 16-2

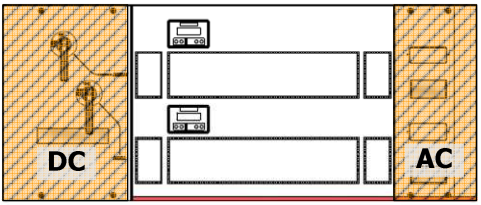


Figure 16-5: Panels to be removed to acces DC and AC Fuses.

Table 16-2: TABLE OF VISUAL AND SCREW CHECKS

To be checked and/or tightened	Check point
AC fuse box	Connection points (visible by removing the AC panel of Figure 16-5)
DC fuse box	Connection points (visible by removing the DC panel of Figure 16-5)
AC input bars	Connection points Figure 5-6, Figure 5-11
DC input bars	Connection points Figure 5-5, Figure 5-10
DC switches	Connection points (visible by removing the DC panel of Figure 16-5)

To remove the panels it may be necessary to disconnect the wire of the earth connection. Remember to reconnect this wire before reclosing every single panel!

The internal inspection of the modules can only be carried out by a specialist, suitably trained technician.

➲ The visual inspection also includes checking any points where there is an evident change in colour compared to other similar points. It is important to check that there is no change in colour over time at the anchorage points, around the screws and in the insulation. Any nonuniform anomalous colouring indicates thermal stress and therefore possible functioning problems. In such case, contact your dealer who will assess whether a replacement is needed. Also check for any corroded spots.

➲ If checks have been completed, replace the panels and the relative earth connections correctly.

16.1.3 Checks of the ACBOX area

The following checks regard the cooling system and the protection devices positioned in the ACBOX area, and it is therefore necessary to remove the front panel indicated in Figure 10-9.

Chapter §10.2.3

DANGER

Before removing the panel, carry out the operations to switch off the inverter. DISCONNECT the AC voltage and wait at least 5 minutes before removing!

Replace the panel after the checks have been completed.

16.1.3.1 Fan control[1]

The module fans are monitored automatically when the inverter is functioning, and therefore they do not need to be checked.

To check the correct functioning of the fans in the ACBOX area, carry out the following procedure:

- Note the current position of the thermostat shown in Figure 16-6 (in order to restore the initial condition later: it is normally set at approx. 40°C).

The thermostat is situated behind the clamps group (Figure 10-10 – (6) and Figure 10-11 – (4)).

- Turn the knob of the thermostat temperature completely counter-clockwise (the QS2 switch must be ON).
- In this position of the thermostat the fans will be activated. Make sure all are moving regularly and do not produce unusual noises.
- Turn the thermostat back to the value noted previously.

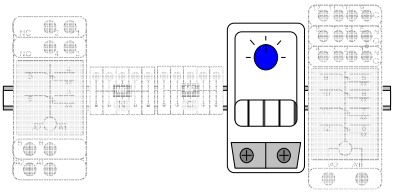


Figure 16-6: Thermostat

16.1.3.2 Check of the power switch operation

- To check, press with a screwdriver the button indicated with the word TEST on the disconnecting switch (Figure 10-10 – (4) and Figure 10-11 – (3)). Make sure that the knob turns clockwise from the “ position to the yellow “Tripped”.0” position
- Before replacing the panel, rotate counter-clockwise in 0 position. Use a hex wrench to leverage on the rod and keep the shaft perpendicular to the switch). AC knob

[1] Also valid for ACBOX Transformer

16.1.3.3 OVR AC device check.

Check that the inspection windows are not coloured in red. If so, replace the faulty cartridges with others of the same type.

➲ It is necessary to check the fuses in the fuse boxes (FH) of Figure 16-7. Use 14x51 50A gG fuses.

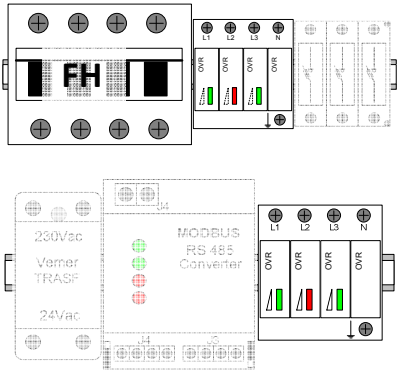


Figure 16-7: OVR AC Devices for versions ≤220kW with transformer

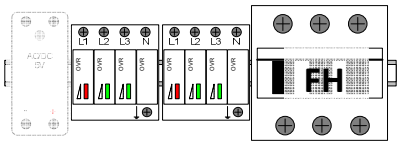


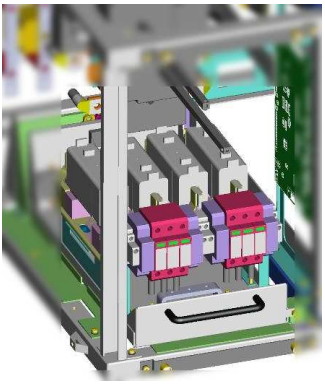
Figure 16-8: OVR AC Devices for versions without transformer or ≥275kW

16.1.4 Checks on the Framework

16.1.4.1 OVR DC device check.

The inspection of the OVR (overvoltage discharger) DC device is performed automatically: the display will indicate it by timely reporting. In this case, the faulty cartridge must be replaced.

The OVR DC devices are to the left of every module, as indicated in the figure below.



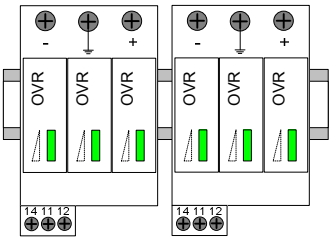


Figure 16-9: OVR DC Devices

The left cartridge refers to the high module, while the right cartridge refers to the lower module.

In the Master-slave version a single OVR device is provided. In this case, the fault signalling takes place on both displays of the framework.

16.1.4.2 Check of the AC fuses

For this inspection, it is not necessary to open the AC panel and switch off the inverter: you can visually check if the fuses are intact through the appropriate windows (Figure 16-5).
The state of the fuse is signalled by a small lever above each fuse: when the fuse is intact, the lever is horizontal and attached to the fuse box; in case of interruption the lever will be vertical.

16.1.4.3 Check of the DC fuses

In case of a broken fuse, the inverter could fail to detect sunlight and always indicate that there is no sun.

For this inspection, it is necessary to open the AC panel and switch off the inverter: you can visually check if the fuses are intact through the appropriate windows (Figure 16-5).

16.1.5 Check of warning cards and signalling devices

Check that all labels bearing warnings or indications are intact and well bonded to the chassis of the inverter. In particular, the danger labels should always be clearly visible.

16.2. Replacement of faulty battery

NOTICE

This component must be replaced only by a qualified technician.

To remove the battery, the module must be withdrawn from its seat.
Each 55kWp module present in the inverter has a Lithium buffer battery of CR203 type2.

Its function is to keep the internal watch powered for statistical calculations.
If the system signals “Battery Fail” on the display, contact your dealer for possible replacement.

If the battery fails, the system will still function, even if the energy data will not be correct.

17. SWITCHING OFF AND DISCONNECTING THE SYSTEM

DANGER

If it is necessary to operate on exposed parts (not protected by panels), it is not sufficient to turn the grid switches (AC) and field switches (DC) to 0 (OFF), because the input cables are always under voltage!
Turn off and disconnect the inverter.

Chapter §17

MANDATORY UPSTREAM DISCONNECTION

17.1. Disconnection from the AC grid

The procedure for disconnecting AURORA from the grid is the following:

1. It is advisable to set all Master modules of the rack on the REMOTE OFF position by means of the display.

   In this way, the power fed into the grid is practically null and the AC switch can be opened in the absence of any load.
2. Turn the AC switch to the 0 position, i.e. turn it counter-clockwise:
   a. The inverter disconnects from the AC grid and therefore it no longer supplies power.
   b. All the displays of the rack relative to the open switch will signal an AC switch alarm.
      The LED flashes. POWER ON
      The ALARM LED is on.
      The MISSING GRID LED is on.

In this phase, it is possible that the modules display a different error in the first minute, since the opening of the grid switch is interrupted and a Grid Fault alarm or similar may be triggered off. After the recovery time (e.g. 60 sec), the signal will be the same on all modules.

17.2. Disconnecting the photovoltaic field

Below, the procedure for disconnecting AURORA module 55kW from the photovoltaic field (DC):

1. Make sure that the AC switch is in 0 position.

   Chapter §17.1

2. One at a time, turn the DC switches to the 0 position (Figure 6-8 - A), i.e. turn them counter-clockwise:

   Chapter §6

   a. In the case of Multi-Master/Slave, both switches of a framework must be turned so that the modules are physically disconnected from the field (Table 6-2,).
   b. In the case of Multi-Master, every single switch disconnects the relative module from the photovoltaic field (Table 6-1).
   c. In the case of 1Master/nSlave, all switches of a rack must be turned so that the modules are physically disconnected from the field (Table 6-3). Disconnection is also possible from the external DC switch.

WARNING

Before proceeding to the next step, wait 30 minutes to ensure there is a proper heat dissipation through the system fans.

17.3. Disconnection from the auxiliary line

To perform this operation it is necessary to act on the possible main switch located upstream (by the installer) or to act on the internal QS2 switch, according to the following steps:

1. Follow the directions regarding the disconnection of the AC and DC, and then go to next step.

   Chapter §17.1
   Chapter §17.2

2. Remove the front panel (Figure 10-9) and set the QS2 switch to OFF to disconnect the auxiliary supply (Figure 11-7, Figure 11-8).

At this point, the system is completely disconnected and switched off.

17.4. Upstream disconnection of the inverter

If it is necessary to move/remove or scrap the PVI-XXX.0(-TL), or in any case to completely insulate it from the rest of the plant, it is absolutely mandatory to disconnect the device from both the DC and AC sides, i.e. from the photovoltaic field and from the grid. To do this, it is necessary to disconnect the DC input voltage and the output distribution lines connected to the AC clamps, and the 3P+N auxiliary power.

This operation can be performer exclusively by acting on the switches located on the distribution line and in the PV plant and not on behalf of the switches located on the inverter device.

At this point, if necessary, the DC and AC cables can be physically disconnected from the inverter, removing the necessary panelling.

Chapter §10.2.3, Chapter §17.1
Chapter §17.2, Chapter §17.3

17.5. Removal and insertion of a 55kWp module

For some types of extraordinary intervention it may be necessary to remove a 55kWp module from its seat (for example, in case of module breakdown).

17.5.1 Preliminary operations

A module weighs too much to be supported by a person, therefore it is necessary to use a mechanical aid to facilitate the withdrawal operation and the further insertion (see the figures below as an example).

1. Follow the directions regarding the disconnection of the AC and DC, and then go to next step.

Chapter §17

2. Remove the convex panel on the front of the module to be removed (Figure 5-1 - C, Figure 5-2 – C, Figure 10-9 - F).
3. Locate the module to withdraw and remove the 4 blocking screws of the 55kWp module.

17.5.2 Removing the module

After having completed the previous paragraph, follow the indications:

1. Place the lifting trolley with the platform or prongs in line with the base of the module to be withdrawn.

NOTICE

DO NOT JERK!

2. Pull the module approx. 15cm from the framework and place the lifting trolley with the platform or prongs under the base of the module to be withdrawn.

3. Finish withdrawing the module completely from the seat.

17.5.3 Insertion of the module

1. Align the platform on which the module to be inserted is positioned, with the supporting brackets of the framework.
2. Push the module into the framework, leaving off approx. 15cm.

NOTICE

DO NOT PUSH THE FAN GRILLS!

3. Remove the trolley and push the 55kWp module firmly so that it enters the framework.
4. Insert the 4 blocking screws of the 55kWp module.
5. Couple the convex panel.

17.5.4 Final operations

1. After having completed the previous paragraph, follow the indications:
2. Perform the commissioning again following the relative instructions.

Chapter §12

17.6. Removal and insertion of the DC fuses drawer

While performing some types of extraordinary operations it may be necessary to remove the DC fuses drawer from it's space in the framework (Figure 5-1-B, Figure 5-2-B) (for example in the cases of replacing fuses).

17.6.1 Initial operations

1. Disconnect the 55kW modules from the PV plant.

Capitolo §17

2. Remove the DC panel (Figure 16-5) where the switch handles are located.

While removing the panel it is mandatory to disconnect the grounding cable connected. Remember to re-connect before closing again.

DANGER

TO EXTRACT THE DRAWER PULL ONLY THE SPECIAL HANDLE.
WARNING, THE FUSES ARE ALWAYS SUBJECT TO VOLTAGE UNLESS THE INVERTER HASN'T BEEN PREVIOUSLY DISCONNECTED

3. Disconnect the signal cables of the power dischargers J13 and J17 from the board located on the right side of the DC fuses space.(Figura 17-1)

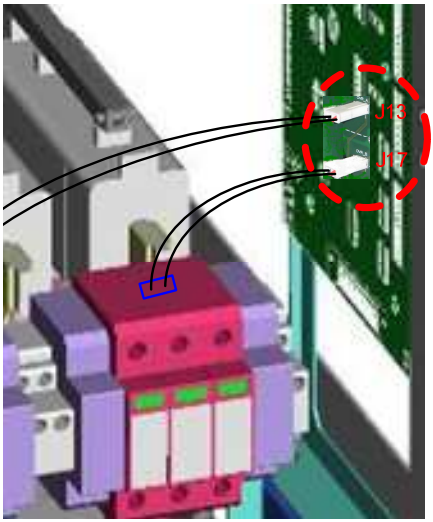


Figura 17-1: Connection of the DC drawer to the board

17.6.2 Removal of the DC drawer

After completing the above steps, follow the hereinafter steps:

1. Unscrew the two holding screws of the Dc drawer. (Figura 17-2)

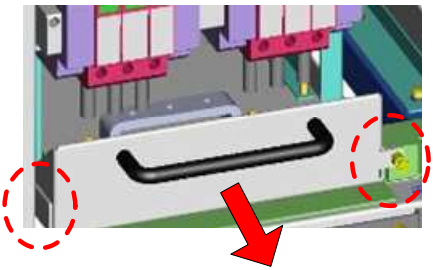


Figura 17-2: DC drawer holding screws

2. Pull the drawer until the standstill point.
3. Lift slightly and complete extraction of the DC drawer supporting from beneath with the other hand. (Figura 17-3).

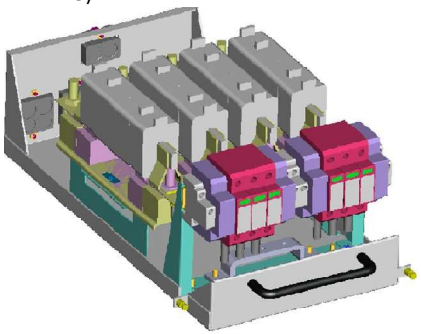


Figura 17-3: DC drawer

17.6.3 Final operation

After completing the maintainance operations perform the procedure in reverse mode and apply the commissioning again following the related instructions

Capitolo §12

17.7. Removal and insertion of the AC drawer (only models –TL)

While performing some types of extraordinary operations it may be necessary to remove the AC drawer from it's space in the ACBOX (Figure 5-1-A, Figure 5-2-A) (for example in case of replacing cartridges of the AC dischargers).

17.7.1 Initial operations

1. Disconnect the AC grid.

Capitolo §17.1

2. Remove the AC panel (Figure 5-2-A)

Capitolo §10.2.3

While removing the panel it is mandatory to disconnect the grounding cable connected. Remember to re-connect before closing again!

DANGER

TO EXTRACT THE DRAWER PULL ONLY THE SPECIAL HANDLE

3. Unscrew the two Ac drawer blocking screws (Figura 17-4).

WARNING

Before extracting the AC drawer beware that the cables connected during the installation to the signal terminal and to the auxiliary input are long enough to allow the extraction of the drawer without causing damage.

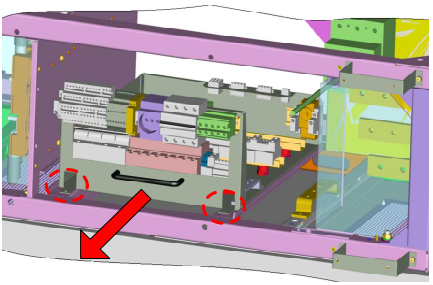


Figura 17-4: Holding screws of the AC drawer

17.7.2 Partial extraction of the AC drawer

After completing the above steps, follow the hereinafter steps:

1. Pull the AC drawer using the special handle.
2. Extract the drawer to a length of about 10 cm from the ACBOX until the standstill point.

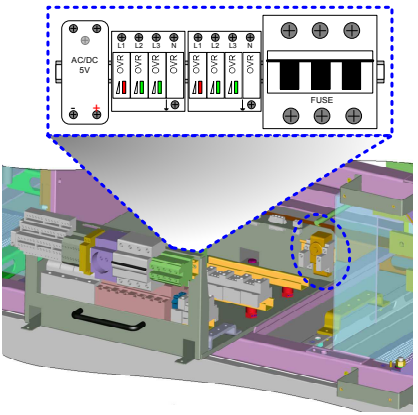


Figura 17-5: Maintainance Position of the AC drawer

3. Perform the needed maintainance as example replacement of the OVR cartridges and related fuses or the fan thermostat setting . (**Error! Reference source not found.**)

17.7.3 Removal of the AC drawer

Only in exceptional cases it is possible to proceed to the extraction of the AC drawer. In these cases it is important to follow the complete disconnection procedure.

Capitolo §17

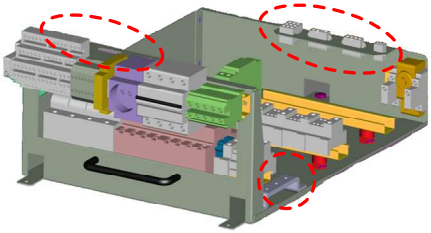


Figura 17-6: AC drawer

1. Extract the ACBOX drawer until the standstill point.
2. Disconnect all the connectors located in the drawer (connectors of the signal terminal, power connectors, grounding cables, ecc..).
3. Lift slightly and complete extraction of the AC drawer supporting the weight with the other hand. (Figura 17-6)

17.7.4 Final operation

After completing the maintainance operations perform the procedure in reverse mode and apply the commissioning again following the related instructions.

Capitolo §12

18. SCRAPPING

When the PVI-XXX.0(-TL) must be scrapped, it must be completely disconnected.

Chapter §17

Take the PVI-XXX.0(-TL) to an authorised collection point.

Chapter §1.1

19. TROUBLESHOOTING

19.1. FAQ (Frequently Asked Question)

Before the product is dispatched, various tests are carried out successfully, in order to check: the functioning, the protection devices, the performances.

Such tests, together with the Power-One quality assurance system, guarantee optimal operation of AURORA.

If a problem arises, the following events occur on one or all of the modules:

- **The red LED "*ALARM*" is always on (ON)**
- **The green LED "*POWER ON*" flashes**
- **The module concerned, or all the modules, disconnect from the grid.**

In the case of breakdown, the system waits 60 seconds (standard value), then cancels the fault signal and attempts to reconnect to the distribution grid.
If, after this time, the system continues to signal an error, deal with the problem according to the following instructions.

Follow the indications in the following table if the problem detected coincides with one of the cases described.
If there are no doubts, and if none of the solutions is of help, you must contact your dealer.

Table 19-1: Troubleshooting

PROBLEM (FAQ)	POSSIBLE CAUSE	SOLUTION
Software		
The serial communication of one or more Modules does not work	a) Interrupted line b) Wrong termination c) Repeated addresses d) Faulty card	Make sure that: a) There are no interruptions of the line b) The termination must be enabled only on the last one of the chain Chapter §8, Chapter §11.7.2 c) There should not be similar addresses in the whole chain Chapter §11.7.6 d) Contact the dealer
The communication seems to be working but all the modules are not "visible" from the scanning program.	The configuration baud rate of the Modules is different from that of the adapters.	Use the default 9600 baud-rate configuration.
Signalling on the Display		
Faulty (SPD / OVR) Discharger	The SPD has intervened (for overvoltage) and must be replaced.	Replace the damaged cartridge/s Chapter §16.1.4.1
The LED "*Missing Grid*" is on	a) Grid switch open b) An anomaly was detected on the distribution grid	a) Make sure that the grid switch is in ON position b) Make sure there are no electrical grid problems due to the manager (in this case wait for recovery)
The display signals "*Waiting remote on*"	a) The "Software ON/OFF" control was enabled from the display b) The "Remote ON/OFF" signal was opened on the terminal block	a) Cancel the SOFTWARE ON/OFF command by setting it on "Not Active" (Figure 13-3) b) Close the signal. Chapter §11.7.5

PROBLEM	POSSIBLE CAUSE	SOLUTION
The display signals *"Waiting for sun"*	The photovoltaic system does not provide enough power to connect the inverter (e.g. cloudy sky)	Wait until environmental conditions are favourable
The inverter indicates a fault on one of the StringComb.	One or more parameters controlled by the string box is/are over the limit	Verify that the information in the PVI-STRINGCOMB manual covers this series. If necessary contact the dealer.
The inverter does not receive DC voltage from the panels and remains in Energy save (SE)	a) DC switch is open. b) Interruption in the DC line c) The field voltage is insufficient	a) Close the DC switch placed on the front of the inverter. b) Are the DC cables connected? Is there an open switch upstream? c) check the DC voltage of the field.

19.2. Before contacting the dealer (Questionnaire)

In case of problems which cannot be solved directly, and in any event whenever it is necessary to contact the dealer, we advice you to make a note of the following information:

19.2.1 Problems on the StringCombs

INFORMATION ON STRINGCOMBS

(1) Type of problem.
(2) Number of PVI-STRINGCOMB(-S) in the system.
(3) Number of PVI-STRINGCOMB(-S) involved in the problem.
(4) Where are they installed? (ground, roof, etc.)
(5) Has the last PVI-STRINGCOMB(-S) of the series chain been terminated?
(6) How many strings enter the PVI-STRINGCOMB(-S)?
(7) Composition of a string:
(8) Number of panels in a series.
(9) Type of panels (Producer and Model).
(10) Other information (e.g. Are there any diodes?
(11) Is the photovoltaic field insulated from ground?

19.2.2 Problems on the PVI-XXX.0(-TL)

INFORMATION ON THE INVERTER

Information available directly from the LCD display

(1) AURORA model ?
(2) Serial number ?
(3) Week of production ?
(4) What is the state of each LED ? (flashing, on or off ?)
(5) What signals are visualised on the display ?
(6) Brief description of the fault.
(7) Have you noticed if the fault is due to any specific operation ?
(8) If so, which ?
(9) Have you noticed if the fault is cyclical ?
(10) If so, how often ?
(11) Was the fault apparent at the moment of installation ?
(12) Describe the atmospheric conditions at the time of occurrence of the fault.

INFORMATION on the Photovoltaic Field

(13) Make and model of photovoltaic panels
(14) Plant structure:
- maximum array voltage and current values
- number of array strings
- number of panels for each string

20. ERROR MESSAGES AND CODES

The state of the system is indicated by a warning sign (Warning) or an error sign (Error) visualised on the LCD display.
The Table 20-1 which follows briefly describes the two types of signals that may appear.

20.1. Warning

These indicate the state of AURORA, therefore they are not caused by a fault and do not imply the need for any action (lack of grid, sun, etc.). These will cease to be displayed as soon as normal conditions will be restored. Warnings are indicated in the table below by a “W”.

20.2. Error

Indicate a possible fault of the apparatus or of the elements connected to it. Also in this case, the signal will disappear as soon as the causes are identified. The occurrence of an error signal generally implies an intervention that is maintained by Aurora as much as possible, or it will provide appropriate indications in order to assist the person working on the device or plant, to perform the necessary maintenance. Errors are indicated in the table below by an “E”.

After the connection, if the inverter receives incorrect information during the test cycle, the system will interrupt such cycle and will signal the warning or error code.
The system will continue to repeat the visualisation of the error message until the error has been removed.

Once the error has been removed, the inverter resets all functions in progress and automatically restarts the connection.

Chapter §12.1

Table 20-1: Table of Error Messages and Codes

Message	W (warning)	E (error)	Description
OC Panel		E001	Over Current DC Input Voltage
Bulk OV		E004	Over Voltage DC Input Voltage on Capacitors
Communication		E005	DSP Communication Error
OC		E006	Over Current AC Grid Voltage
OCH		E007	Over Current IGBT or Over Current Hardware.
Over Temp		E014	Over Temperature (detail visible from software)
Delta Bulk		E015	Over Unbalance of DC Voltage on Input Capacitors
Grid OV	W004		Over Voltage AC Grid Voltage
Grid UV	W005		Under Voltage AC Grid Voltage
Grid OF	W006		Over Frequency AC Grid Voltage
Grid UF	W007		Under Frequency AC Grid Voltage
Forbidden State		E009	Non-admitted State
UTH		E033	Under Temperature (detail visible from software)
Remote OFF		E035	Remote Off
Pneg	W014		Zero Exported Power
Grid df/dt	W015		Variation df/dt Grid Frequency
DEN Switch Open SPD Switch Open	W016		Surge Protector Device (SPD) Failure (cartridge to be replaced)
UC Panel		E037	Negative Over Current DC Input Voltage
FAN Stucked		E038	One or both fans are blocked
DC Switch Open		E039	DC Voltage Input Switch Open
JboxFail	W017		One or more StringCombs have communicated a problem
TRAS Switch Open		E040	AC Voltage Output Switch Open
Relay AC		E041	Internal AC contactor has not switched over
Bulk UV		E042	Under Voltage DC Input Voltage on Capacitors
Auto exclusion		E043	Auto-exclusion of the Module due to Repeated Faults
RISO		E025	Insulation resistance below minimum threshold

21. TECHNICAL DATA

Approvals	
EMC	EN 61000-6-2, EN 61000-6-4 EN 61000-3-11; EN 61000-3-12
CE Compliance	Yes
Grid connection	Guide for Enel Ed.1.1/09, BDEW, RD1663/2000 grid connections
Pollution Degree	In compliance with the CEI EN 50178 standard Pollution Degree 2 (normally there is only non-conductive pollution)

21.1. Technical data tables

The following tables show the characteristics of the PVI-XXX.0(-TL).

Table 21-1: Technical Data PVI-55.0(-TL)

Characteristics	PVI-55.0	PVI-55.0-TL
Input Parameters		
Nominal PV power [kWp]	56,4	56,4
Total (master/slave mode)	59	59
Absolute maximum input voltage [Vdc]	1000	1000
MPPT input voltage range [Vdc]	485 - 850	485 - 850
Multi-master configuration	1	1
Multi-master/slave configuration	na	na
Master/slave	1	1
Total Maximum input current [Adc]	123	123
Multi-master mode (each module)	123	123
Input Reflected Ripple voltage	<3%	<3%
Number of DC inputs	1	1
Max. DC input wire (each polarity)(reduced terminal size)	1x185mmq (M10)	1x185mmq (M10)
Standard Equipment - Input		
Insulation Control	Yes, with alarm	Yes, with alarm
Reverse polarity and backfeed current protection (each input)	YES, with series diode	YES, with series diode
Input fuse overcurrent protection (no for Multi-Master cof.)	125A/1000V	125A/1000V
Load-breaking internal DC switch	200A/1000V	200A/1000V
Input overvoltage protection	Yes	Yes
Output Parameters		
Nominal AC Output Power, PACnom [up to 50°C, kW]	55	55
Nominal AC Output Current [Arms]	81	101
AC Output Voltage range [Vrms]	3 x 400 +/-15%	3 x 320 +/-20%
Nominal AC Frequency [Hz]	50 / 60	50 / 60
Nominal Power Factor / adjustment range [cos ϕ]	1 / -0.95...+0.95 (@ Pac nominal)	1 / -0.95...+0.95 (@ Pac nominal)
AC Current Harmonics [THD%]	< 4% (@ Pac nominal)	< 4% (@ Pac nominal)
Inverter Switching Frequency [kHz]	18	18
Max AC output wire section (each phase)	1x95mmq (M8)	2x300mmq (M12)
Standard Equipment – Output		
AC Contactor (night time disconnect)	Yes	No
AC Output Circuit Breaker (Magnetothermic switch) / Breaking capacity [kA] (*) 300Vac side of the transformer	Yes / 50kA	Yes / 50kA
AC side overvoltage protection (power and aux input)	Yes	Yes
Conversion Efficiency @ Vdc=485V and Vac=320Vrms		
Peak Efficiency %	96,30%	98,00%
Euro Efficiency %	95,10%	97,71%
CEC Efficiency %	95,80%	97,78%
Environmental Parameters		
Environmental Protection Degree (acc to EN 60529)	IP20	IP20
Operating with output power derating Temperature Range	-10°C...+60°C	-10°C...+60°C
Required ambient air cooling flow	1600m3/h	1600m3/h
Relative Humidity (non-condensing)	< 95%	< 95%
Maximum altitude above sea level without derating [mt]	1000	1000
Audible Noise [dBA @ 1mt]	<62	<60
Auxiliary Supply		
External Auxiliary Supply Voltage	3x400Vac + N, 50/60Hz	3x400Vac + N, 50/60Hz
Maximum consumption in operation	<0.36% PACnom	<0.24% PACnom
Maximum consumption in operation (ac-box fan off)	<0.25% PACnom	<0.22% PACnom
Night time losses [W]	<17W	<12W
Communication/User Interface		
Communication Port (PC / Data logger)	1 x RS485 (RS485_USR)	1 x RS485 (RS485_USR)
Communication - String Combiner boxes	1 x RS485 (RS485_2)	1 x RS485 (RS485_2)
Remote Communication (optional)	WEBLOGGER (Ethernet, GPRS)	WEBLOGGER (Ethernet, GPRS)
User Interface	2-lines Display	2-lines Display
Mechanical Characteristics		
Dimensions (WxHxD) [mm]	1250 x 1607(*) x 870(**)	1250 x 1077(*) x 870(**)
(*) Output Air conduit not included		
(**) AC Switch Handle not included		
Overall Weight [kg]	800	380
55kW module Weight [kg]	60	60

Table 21-2: Technical Data PVI-110.0(-TL)

Characteristics	PVI-110.0	PVI-110.0-TL
Input Parameters		
Nominal PV power [kWp]	112,8	112,8
Total (master/slave mode)	118	118
Per channel (multi-master mode)	59	59
Absolute maximum input voltage [Vdc]	1000	1000
MPPT input voltage range [Vdc]	485 - 850	485 - 850
Multi-master configuration	2	2
Multi-master/slave configuration	n.a.	n.a.
Master/slave	1	1
Total Maximum input current [Adc]	246	246
Multi-master mode (each module)	123	123
Input Reflected Ripple voltage	<3%	<3%
Number of DC inputs	2	2
Max. DC input wire (each polarity)(reduced terminal size)	1x185mmq + 1x300mmq (M10)	1x185mmq + 1x300mmq (M10)
Standard Equipment - Input		
Insulation Control	Yes, with alarm	Yes, with alarm
Reverse polarity and backfeed current protection (each input)	YES, with series diode	YES, with series diode
Input fuse overcurrent protection (no for Multi-Master cof.)	125A/1000V	125A/1000V
Load-breaking internal DC switch	200A/1000V	200A/1000V
Input overvoltage protection	Yes	Yes
Output Parameters		
Nominal AC Output Power, PACnom [up to 50°C, kW]	110	110
Nominal AC Output Current [Arms]	162	202
AC Output Voltage range [Vrms]	3 x 400 +/-15%	3 x 320 +/-20%
Nominal AC Frequency [Hz]	50 / 60	50 / 60
Nominal Power Factor / adjustment range [cos ϕ]	1 / -0.95...+0.95 (@ Pac nominal)	1 / -0.95...+0.95 (@ Pac nominal)
AC Current Harmonics [THD%](6)	< 4% (@ Pac nominal)	< 4% (@ Pac nominal)
Inverter Switching Frequency [kHz]	18	18
Max AC output wire section (each phase)	1x95mmq (M8)	2x300mmq (M12)
Standard Equipment – Output		
AC Contactor (night time disconnect)	Yes	No
AC Output Circuit Breaker (Magnetothermic switch) / Breaking capacity [kA] (*) 300Vac side of the transformer	Yes / 50kA	Yes / 50kA
AC side overvoltage protection (power and aux input)	Yes	Yes
Conversion Efficiency @ Vdc=485V and Vac=320Vrms		
Peak Efficiency %	96,40%	98,00%
Euro Efficiency %	95,20%	97,71%
CEC Efficiency %	95,90%	97,78%
Environmental Parameters		
Environmental Protection Degree (acc to EN 60529)	IP20	IP20
Operating with output power derating Temperature Range	-10°C...+60°C	-10°C...+60°C
Required ambient air cooling flow	2800m3/h	2400m3/h
Relative Humidity (non-condensing)	< 95%	< 95%
Maximum altitude above sea level without derating [mt]	1000	1000
Audible Noise [dBA @ 1mt]	<65	<63
Auxiliary Supply		
External Auxiliary Supply Voltage	3x400Vac + N, 50/60Hz	3x400Vac + N, 50/60Hz
Maximum consumption in operation	<0.31% PACnom	<0.24% PACnom
Maximum consumption in operation (ac-box fan off)	<0.23% PACnom	<0.22% PACnom
Night time losses [W]	<24W	<19W
Communication/User Interface		
Communication Port (PC / Data logger)	1 x RS485 (RS485_USR)	1 x RS485 (RS485_USR)
Communication - String Combiner boxes	1 x RS485 (RS485_2)	1 x RS485 (RS485_2)
Remote Communication (optional)	WEBLOGGER (Ethernet, GPRS)	WEBLOGGER (Ethernet, GPRS)
User Interface	2-lines Display	2-lines Display
Mechanical Characteristics		
Dimensions (WxHxD) [mm]	1250 x 1607(*) x 870(**)	1250 x 1077(*) x 870(**)
(*) Output Air conduit not included		
(**) AC Switch Handle not included		
Overall Weight [kg]	900	480
50kW module Weight [kg]	60	60

Table 21-3: Technical Data PVI-165.0(-TL)

Characteristics	PVI-165.0	PVI-165.0-TL
Input Parameters		
Nominal PV power [kWp]	169,2	169,2
Total (master/slave mode)	177	177
Per channel (multi-master mode)	59	59
Absolute maximum input voltage [Vdc]	1000	1000
MPPT input voltage range [Vdc]	485 - 850	485 - 850
Multi-master configuration	3	3
Multi-master/slave configuration	2	2
Master/slave	1	1
Total Maximum input current [Adc]	369	369
Multi-master mode (each module)	123	123
Input Reflected Ripple voltage	<3%	<3%
Number of DC inputs	3	3
Max. DC input wire (each polarity)(reduced terminal size)	2x185mmq + 1x300mmq (M10)	2x185mmq + 1x300mmq (M10)
Standard Equipment - Input		
Insulation Control	Yes, with alarm	Yes, with alarm
Reverse polarity and backfeed current protection (each input)	YES, with series diode	YES, with series diode
Input fuse overcurrent protection (no for Multi-Master cof.)	125A/1000V	125A/1000V
Load-breaking internal DC switch	200A/1000V	200A/1000V
Input overvoltage protection	Yes	Yes
Output Parameters		
Nominal AC Output Power, PACnom [up to 50°C, kW]	165	165
Nominal AC Output Current [Arms]	243	303
AC Output Voltage range [Vrms]	3 x 400 +/-15%	3 x 320 +/-20%
Nominal AC Frequency [Hz]	50 / 60	50 / 60
Nominal Power Factor / adjustment range [cos ϕ]	1 / -0.95...+0.95 (@ Pac nominal)	1 / -0.95...+0.95 (@ Pac nominal)
AC Current Harmonics [THD%](6)	< 4% (@ Pac nominal)	< 4% (@ Pac nominal)
Inverter Switching Frequency [kHz]	18	18
Max AC output wire section (each phase)	1x185mmq (M10)	2x300mmq (M12)
Standard Equipment – Output		
AC Contactor (night time disconnect)	Yes	No
AC Output Circuit Breaker (Magnetothermic switch) / Breaking capacity [kA] (*) 300Vac side of the transformer	Yes / 50kA	Yes / 50kA
AC side overvoltage protection (power and aux input)	Yes	Yes
Conversion Efficiency @ Vdc=485V and Vac=320Vrms		
Peak Efficiency %	96,50%	98,00%
Euro Efficiency %	95,30%	97,71%
CEC Efficiency %	96,00%	97,78%
Environmental Parameters		
Environmental Protection Degree (acc to EN 60529)	IP20	IP20
Operating with output power derating Temperature Range	-10°C...+60°C	-10°C...+60°C
Required ambient air cooling flow	4000m3/h	3200m3/h
Relative Humidity (non-condensing)	< 95%	< 95%
Maximum altitude above sea level without derating [mt]	1000	1000
Audible Noise [dBA @ 1mt]	<68	<66
Auxiliary Supply		
External Auxiliary Supply Voltage	3x400Vac + N, 50/60Hz	3x400Vac + N, 50/60Hz
Maximum consumption in operation	<0.3% PACnom	<0.24% PACnom
Maximum consumption in operation (ac-box fan off)	<0.23% PACnom	<0.22% PACnom
Night time losses [W]	<31W	<26W
Communication/User Interface		
Communication Port (PC / Data logger)	1 x RS485 (RS485_USR)	1 x RS485 (RS485_USR)
Communication - String Combiner boxes	1 x RS485 (RS485_2)	1 x RS485 (RS485_2)
Remote Communication (optional)	WEBLOGGER (Ethernet, GPRS)	WEBLOGGER (Ethernet, GPRS)
User Interface	2-lines Display	2-lines Display
Mechanical Characteristics		
Dimensions (WxHxD) [mm]	1250 x 2116(*) x 870(**)	1250 x 1586(*) x 870(**)
(*) Output Air conduit not included		
(**) AC Switch Handle not included		
Overall Weight [kg]	1200	680
50kW module Weight [kg]	60	60

Table 21-4: Technical Data PVI-220.0(-TL)

Characteristics	PVI-220.0	PVI-220.0-TL
Input Parameters		
Nominal PV power [kWp]	225,6	225,6
Total (master/slave mode)	236	236
Per channel (multi-master mode)	59	59
Absolute maximum input voltage [Vdc]	1000	1000
MPPT input voltage range [Vdc]	485 - 850	485 - 850
Multi-master configuration	4	4
Multi-master/slave configuration	2	2
Master/slave	1	1
Total Maximum input current [Adc]	492	492
Multi-master mode (each module)	123	123
Input Reflected Ripple voltage	<3%	<3%
Number of DC inputs	4	4
Max. DC input wire (each polarity)(reduced terminal size)	2x185mmq + 2x300mmq (M10)	2x185mmq + 2x300mmq (M10)
Standard Equipment - Input		
Insulation Control	Yes, with alarm	Yes, with alarm
Reverse polarity and backfeed current protection (each input)	YES, with series diode	YES, with series diode
Input fuse overcurrent protection (no for Multi-Master cof.)	125A/1000V	125A/1000V
Load-breaking internal DC switch	200A/1000V	200A/1000V
Input overvoltage protection	Yes	Yes
Output Parameters		
Nominal AC Output Power, PACnom [up to 50°C, kW]	220	220
Nominal AC Output Current [Arms]	324	404
AC Output Voltage range [Vrms]	3 x 400 +/-15%	3 x 320 +/-20%
Nominal AC Frequency [Hz]	50 / 60	50 / 60
Nominal Power Factor / adjustment range [cos ϕ]	1 / -0.95...+0.95 (@ Pac nominal)	1 / -0.95...+0.95 (@ Pac nominal)
AC Current Harmonics [THD%](6)	< 4% (@ Pac nominal)	< 4% (@ Pac nominal)
Inverter Switching Frequency [kHz]	18	18
Max AC output wire section (each phase)	1x185mmq (M10)	2x300mmq (M12)
Standard Equipment – Output		
AC Contactor (night time disconnect)	Yes	No
AC Output Circuit Breaker (Magnetothermic switch) / Breaking capacity [kA] (*) 300Vac side of the transformer	Yes / 50kA	Yes / 50kA
AC side overvoltage protection (power and aux input)	Yes	Yes
Conversion Efficiency @ Vdc=485V and Vac=320Vrms		
Peak Efficiency %	96,50%	98,00%
Euro Efficiency %	95,30%	97,71%
CEC Efficiency %	96,00%	97,78%
Environmental Parameters		
Environmental Protection Degree (acc to EN 60529)	IP20	IP20
Operating with output power derating Temperature Range	-10°C...+60°C	-10°C...+60°C
Required ambient air cooling flow	4800m3/h	4000m3/h
Relative Humidity (non-condensing)	< 95%	< 95%
Maximum altitude above sea level without derating [mt]	1000	1000
Audible Noise [dBA @ 1mt]	<72	<69
Auxiliary Supply		
External Auxiliary Supply Voltage	3x400Vac + N, 50/60Hz	3x400Vac + N, 50/60Hz
Maximum consumption in operation	<0.28% PACnom	<0.24% PACnom
Maximum consumption in operation (ac-box fan off)	<0.22% PACnom	<0.22% PACnom
Night time losses [W]	<38W	<33W
Communication/User Interface		
Communication Port (PC / Data logger)	1 x RS485 (RS485_USR)	1 x RS485 (RS485_USR)
Communication - String Combiner boxes	1 x RS485 (RS485_2)	1 x RS485 (RS485_2)
Remote Communication (optional)	WEBLOGGER (Ethernet, GPRS)	WEBLOGGER (Ethernet, GPRS)
User Interface	2-lines Display	2-lines Display
Mechanical Characteristics		
Dimensions (WxHxD) [mm]	1250 x 2116(*) x 870(**)	1250 x 1586(*) x 870(**)
(*) Output Air conduit not included		
(**) AC Switch Handle not included		
Overall Weight [kg]	1300	780
50kW module Weight [kg]	60	60

Table 21-5: Technical Data PVI-275.0(-TL)

Characteristics	PVI-275.0	PVI-275.0-TL
Input Parameters		
Nominal PV power [kWp]	282	282
Total (master/slave mode)	295	295
Per channel (multi-master mode)	59	59
Absolute maximum input voltage [Vdc]	1000	1000
MPPT input voltage range [Vdc]	485 - 850	485 - 850
Multi-master configuration	5	5
Multi-master/slave configuration	3	3
Master/slave	1	1
Total Maximum input current [Adc]	615	615
Multi-master mode (each module)	123	123
Input Reflected Ripple voltage	<3%	<3%
Number of DC inputs	5	5
Max. DC input wire (each polarity)(reduced terminal size)	3x185mmq + 2x300mmq (M10)	3x185mmq + 2x300mmq (M10)
Standard Equipment - Input		
Insulation Control	Yes, with alarm	Yes, with alarm
Reverse polarity and backfeed current protection (each input)	YES, with series diode	YES, with series diode
Input fuse overcurrent protection (no for Multi-Master cof.)	125A/1000V	125A/1000V
Load-breaking internal DC switch	200A/1000V	200A/1000V
Input overvoltage protection	Yes	Yes
Output Parameters		
Nominal AC Output Power, PACnom [up to 50°C, kW]	275	275
Nominal AC Output Current [Arms]	405	505
AC Output Voltage range [Vrms]	3 x 400 +/-15%	3 x 320 +/-20%
Nominal AC Frequency [Hz]	50 / 60	50 / 60
Nominal Power Factor / adjustment range [cos ϕ]	1 / -0.95...+0.95 (@ Pac nominal)	1 / -0.95...+0.95 (@ Pac nominal)
AC Current Harmonics [THD%](6)	< 4% (@ Pac nominal)	< 4% (@ Pac nominal)
Inverter Switching Frequency [kHz]	18	18
Max AC output wire section (each phase)	1x240mmq (M12)	2x300mmq (M12)
Standard Equipment – Output		
AC Contactor (night time disconnect)	No	No
AC Output Circuit Breaker (Magnetothermic switch) / Breaking capacity [kA] (*) 300Vac side of the transformer	Yes / 50kA	Yes / 50kA
AC side overvoltage protection (power and aux input)	Yes	Yes
Conversion Efficiency @ Vdc=485V and Vac=320Vrms		
Peak Efficiency %	96,70%	98,00%
Euro Efficiency %	95,50%	97,71%
CEC Efficiency %	96,20%	97,78%
Environmental Parameters		
Environmental Protection Degree (acc to EN 60529)	IP20	IP20
Operating with output power derating Temperature Range	-10°C...+60°C	-10°C...+60°C
Required ambient air cooling flow	6800m3/h	4800m3/h
Relative Humidity (non-condensing)	< 95%	< 95%
Maximum altitude above sea level without derating [mt]	1000	1000
Audible Noise [dBA @ 1mt]	<75	<72
Auxiliary Supply		
External Auxiliary Supply Voltage	3x400Vac + N, 50/60Hz	3x400Vac + N, 50/60Hz
Maximum consumption in operation	<0.29% PACnom	<0.24% PACnom
Maximum consumption in operation (ac-box fan off)	<0.22% PACnom	<0.22% PACnom
Night time losses [W]	<45W	<40W
Communication/User Interface		
Communication Port (PC / Data logger)	1 x RS485 (RS485_USR)	1 x RS485 (RS485_USR)
Communication - String Combiner boxes	1 x RS485 (RS485_2)	1 x RS485 (RS485_2)
Remote Communication (optional)	WEBLOGGER (Ethernet, GPRS)	WEBLOGGER (Ethernet, GPRS)
User Interface	2-lines Display	2-lines Display
Mechanical Characteristics		
Dimensions (WxHxD) [mm]	1250 x 2095(*) x 870(**)	1250 x 2095(*) x 870(**)
(*) Output Air conduit not included	1250 x 1147 x 870 (trafo box)	
(**) AC Switch Handle not included		
Overall Weight [kg]	1600	1000
50kW module Weight [kg]	60	60

Table 21-6: Technical Data PVI-330.0(-TL)

Characteristics	PVI-330.0	PVI-330.0-TL
Input Parameters		
Nominal PV power [kWp]	338,4	338,4
Total (master/slave mode)	354	354
Per channel (multi-master mode)	59	59
Absolute maximum input voltage [Vdc]	1000	1000
MPPT input voltage range [Vdc]	485 - 850	485 - 850
Multi-master configuration	6	6
Multi-master/slave configuration	3	3
Master/slave	1	1
Total Maximum input current [Adc]	738	738
Multi-master mode (each module)	123	123
Input Reflected Ripple voltage	<3%	<3%
Number of DC inputs	6	6
Max. DC input wire (each polarity)(reduced terminal size)	3x185mmq + 3x300mmq (M10)	3x185mmq + 3x300mmq (M10)
Standard Equipment - Input		
Insulation Control	Yes, with alarm	Yes, with alarm
Reverse polarity and backfeed current protection (each input)	YES, with series diode	YES, with series diode
Input fuse overcurrent protection (no for Multi-Master cof.)	125A/1000V	125A/1000V
Load-breaking internal DC switch	200A/1000V	200A/1000V
Input overvoltage protection	Yes	Yes
Output Parameters		
Nominal AC Output Power, PACnom [up to 50°C, kW]	330	330
Nominal AC Output Current [Arms]	486	606
AC Output Voltage range [Vrms]	3 x 400 +/-15%	3 x 320 +/-20%
Nominal AC Frequency [Hz]	50 / 60	50 / 60
Nominal Power Factor / adjustment range [cos ϕ]	1 / -0.95...+0.95 (@ Pac nominal)	1 / -0.95...+0.95 (@ Pac nominal)
AC Current Harmonics [THD%](6)	< 4% (@ Pac nominal)	< 4% (@ Pac nominal)
Inverter Switching Frequency [kHz]	18	18
Max AC output wire section (each phase)	1x240mmq (M12)	2x300mmq (M12)
Standard Equipment – Output		
AC Contactor (night time disconnect)	No	No
AC Output Circuit Breaker (Magnetothermic switch) / Breaking capacity [kA] (*) 300Vac side of the transformer	Yes / 50kA	Yes / 50kA
AC side overvoltage protection (power and aux input)	Yes	Yes
Conversion Efficiency @ Vdc=485V and Vac=320Vrms		
Peak Efficiency %	96,70%	98,00%
Euro Efficiency %	95,50%	97,71%
CEC Efficiency %	96,20%	97,78%
Environmental Parameters		
Environmental Protection Degree (acc to EN 60529)	IP20	IP20
Operating with output power derating Temperature Range	-10°C...+60°C	-10°C...+60°C
Required ambient air cooling flow	7600m3/h	5600m3/h
Relative Humidity (non-condensing)	< 95%	< 95%
Maximum altitude above sea level without derating [mt]	1000	1000
Audible Noise [dBA @ 1mt]	<78	<75
Auxiliary Supply		
External Auxiliary Supply Voltage	3x400Vac + N, 50/60Hz	3x400Vac + N, 50/60Hz
Maximum consumption in operation	<0.28% PACnom	<0.24% PACnom
Maximum consumption in operation (ac-box fan off)	<0.22% PACnom	<0.22% PACnom
Night time losses [W]	<52W	<47W
Communication/User Interface		
Communication Port (PC / Data logger)	1 x RS485 (RS485_USR)	1 x RS485 (RS485_USR)
Communication - String Combiner boxes	1 x RS485 (RS485_2)	1 x RS485 (RS485_2)
Remote Communication (optional)	WEBLOGGER (Ethernet, GPRS)	WEBLOGGER (Ethernet, GPRS)
User Interface	2-lines Display	2-lines Display
Mechanical Characteristics		
Dimensions (WxHxD) [mm]	1250 x 2095(*) x 870(**)	1250 x 2095(*) x 870(**)
(*) Output Air conduit not included	1250 x 1147 x 870 (trafo box)	
(**) AC Switch Handle not included		
Overall Weight [kg]	1700(*)	1100(*)
50kW module Weight [kg]	60	60

22. DECLARATION OF CONFORMITY

power-one™
Changing the Shape of Power

rif. PVI-330.0-IT & other models (All Countries CE Declaration)

Declaration of Conformity

CE MARKING

We, **Power-One, Inc., 740 Calle Plano, Camarillo, CA. 93012 USA**
declare under our sole responsibility that the product

PRODUCT: Photovoltaic Grid Tied Inverter
MODELS: PVI-X-Y-ZZ
where X may be 55.0, 110.0, 165.0, 220.0, 275.0 or 330.0
where Y may be blank or TL
where ZZ is the country code

to which this declaration relates, is in compliance with the following documents:

Quality Standard(s):	**ISO 9001: 2000**
Directives:	**2006/95/EC, Low Voltage Directive** **2004/108/EC, EMC Directive**
Product Safety Standard(s):	**EN 50178: 1997**
EMC Standards:	**EN 61000-6-4: 2007** **EN 61000-3-11: 2000** **EN 61000-3-12: 2005** **EN 61000-6-2: 2005**

This Declaration of Conformity is not valid any longer, in case, without any written authorization by Power-One, Inc. :
- the products are modified, supplemented or changed in any other way ;
- components, which are not part of the accessories kit, if any, are integrated in the products ;
- the products are used or installed improperly.

(Manufacturer)
Robert P. White Jr.
(Director of Safety)

Camarillo, CA *(Place)*

2010 May 06 *(Date)*

23. CERTIFICATE OF CONFORMITY

KEMA Quality

ATTESTATION OF CONFORMITY

TO ENEL DISTRIBUZIONE SPA REQUIREMENTS

ATTESTATO DI CONFORMITA'

ALLE PRESCRIZIONI ENEL DISTRIBUZIONE SPA

Attestation number
Attestazione numero : **350164100**
Issued to
Rilasciata a : **POWER-ONE ITALY S.p.a**
Via S.Giorgio, 642
52028 Terranuova Bracciolini (AR)
Italy
Manufacturer
Costruttore : **POWER-ONE ITALY S.p.a**
Via S.Giorgio, 642
52028 Terranuova Bracciolini (AR)
Italy
Product Type
Tipo prodotto :

Interface Device *Dispositivo Interfaccia*	Interface Protective Device *Dispositivo protezione interfaccia*	Static Conversion Device *Dispositivo di conversione statico*
☐	☐	☒

Model reference
Riferimento Modello : **Photovoltaic inverter / *inverter fotovoltaico***

Model	Rated Output Voltage (V)	Rated Output Current (A)	Rated Output (VA)	N° phase
PVI-55.0-IT (*)	Nominal = 230Vac (Phase to Neutral) Range = 184Vac to 276Vac (Phase to Neutral) Nominal = 400Vac (Phase to Phase) Range = 320Vac to 480Vac (Phase to Phase)	81 Aac	55000	3
PVI-55.0-TL-IT (**)	Nominal = 320Vac (Phase to Phase) Range = 256Vac to 384Vac (Phase to Phase)	100 Aac	55000	3
PVI-110.0-IT (*)	Nominal = 230Vac (Phase to Neutral) Range = 184Vac to 276Vac (Phase to Neutral) Nominal = 400Vac (Phase to Phase) Range = 320Vac to 480Vac (Phase to Phase)	160 Aac	110000	3
PVI-110.0-TL-IT (**)	Nominal = 320Vac (Phase to Phase) Range = 256Vac to 384Vac (Phase to Phase)	200 Aac	110000	3
PVI-165.0-IT (*)	Nominal = 230Vac (Phase to Neutral) Range = 184Vac to 276Vac (Phase to Neutral) Nominal = 400Vac (Phase to Phase) Range = 320Vac to 480Vac (Phase to Phase)	240 Aac	165000	3
PVI-165.0-TL-IT (**)	Nominal = 320Vac (Phase to Phase) Range = 256Vac to 384Vac (Phase to Phase)	300 Aac	165000	3
PVI-220.0-IT (*)	Nominal = 230Vac (Phase to Neutral) Range = 184Vac to 276Vac (Phase to Neutral) Nominal = 400Vac (Phase to Phase) Range = 320Vac to 480Vac (Phase to Phase)	320 Aac	220000	3
PVI- 220.0-TL-IT (**)	Nominal = 320Vac (Phase to Phase) Range = 256Vac to 384Vac (Phase to Phase)	400 Aac	220000	3

Page/*Pag.* 1 of/*di* 2

Integral publication of this attestation and adjoining reports is allowed. *E' consentita la pubblicazione integrale del presente attestato e del relativo rapporto di prova.*
KEMA Quality B.V. Utrechtseweg 310, 6812 AR Arnhem P.O. Box 5185, 6802 ED Arnhem The Netherlands
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PVI-275.0-IT (*)	Nominal = 230Vac (Phase to Neutral) Range = 184Vac to 276Vac (Phase to Neutral) Nominal = 400Vac (Phase to Phase) Range = 320Vac to 480Vac (Phase to Phase)	400 Aac	275000	3
PVI-275.0-TL-IT (**)	Nominal = 320Vac (Phase to Phase) Range = 256Vac to 384Vac (Phase to Phase)	500 Aac	275000	3
PVI-330.0-IT (*)	Nominal = 230Vac (Phase to Neutral) Range = 184Vac to 276Vac (Phase to Neutral) Nominal = 400Vac (Phase to Phase) Range = 320Vac to 480Vac (Phase to Phase)	480 Aac	330000	3
PVI-330.0-TL-IT (**)	Nominal = 320Vac (Phase to Phase) Range = 256Vac to 384Vac (Phase to Phase)	600 Aac	330000	3

(*) These devices are provided with internal isolation tranformers / *Questi dispositivi sono provvisti di trasformatore di isolamento interno*
(**) These devices shall be provided with suitable external isolation transformer as indicated in the instruction manual / *Questi dispositivi devono essere provvisti di idoneo trasformatore di isolamento esterno come indicato nei manuali del prodotto*

Software release
Versione software : **Software dsp inverter: A.A.0.1 (all models / *tutti i modelli*)**
Software Micro supervisore: B.B.0.1 (all models / *tutti i modelli*)

Testing Laboratory
Laboratorio prove : **Euro Test Laboratori S.r.L., Via dell'Industria 18 – 35020 Brugine (PD), ITALY (SINAL Accreditation No. 0192)**

Test Report ref.
Rapporto di prova Nr. : **CONBT 01 CdO 16424-100078, EMC 01 CdO 16424-100078 and extension letter EXT01 16424-100078 issued by Euro Test Laboratori S.r.L.; CE Declaration of Conformity issued by Power-One Italy S.p.A.**

Requirements
Requisiti : **Guideline for Connections to ENEL DISTRIBUZIONE Network (Ed. 1.1, Dec 2009), sec. F issued by ENEL DISTRIBUZIONE SPA**
Guida per le Connessioni alla Rete Elettrica di ENEL DISTRIBUZIONE (Ed. 1.1, Dic 2009), sez. F emessa da ENEL DISTRIBUZIONE SPA

The undersigned declares that the above described product complies with ENEL requirements. This attestation of conformity is issued based on the test results as laid down in the referred Test Reports. The investigation does not include an assessment of the manufacturer's production.
Il sottoscritto dichiara che il prodotto di cui sopra è conforme alle prescrizioni ENEL. Questo attestato di conformità è rilasciato sulla base dei risultati di prova riferiti nei rapporti di prova sopra menzionati. La valutazione non include una verifica del luogo di produzione.

Date of issue
Emesso in data : 2010-05-06

Franco Vasta

Certification Manager

KEMA QUALITY B.V. is accredited by the Dutch Accreditation Council (RvA) according to EN 45011:1998 and ISO/IEC Guide 65:1996. Accreditation certificate Number C 001, valid until October 7, 2010.
KEMA QUALITY B.V. è accreditata dal Dutch Accreditation Council (RvA) in accordo a EN 45011:1998 e ISO/IEC Guida 65:1996. Certificato di Accreditamento numero C 001, valido fino al 7 Ottobre 2010.

Integral publication of this attestation and adjoining reports is allowed. *E' consentita la pubblicazione integrale del presente attestato e del relativo rapporto di prova.*
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